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ARCHÆOLOGY OF VERMONT.

BY PROF. GEO. H. PERKINS.

IN a paper published in the NATURALIST for December, 1879, the writer attempted to present the chief physical features of the Champlain valley, and to give a general idea of its archæology. That paper may suffice as an introduction to the present and future papers, in which some of the more important groups of archæological objects will be discussed more fully than would be possible in a more comprehensive article. Before proceeding, however, to the main topic of this article, I wish to add a few general statements to those previously given. It has been a cause of some surprise to me to discover a close resemblance between many of our most peculiar Vermont specimens and others from the Mohawk valley and other parts of New York. We should naturally expect to find similarity, as we do, in the specimens found on the eastern and western shores of Lake Champlain, but we should scarcely expect to find many nearly identical specimens in Western Vermont and Central New York. But Mr. Frey, near Palatine bridge, and Rev. Mr. Beauchamp, near Baldwinsville, find stone tubes, carvings, amulets, &c., some of which are precisely like those found in Vermont, but not, at least up to this time, found in the region bordering the western shore of Lake Champlain. In many respects our collections of stone implements and pottery from Western Vermont seem more closely allied to those from the Mohawk and Genesee valleys than to those from other parts of

New England. Vermont is, to a certain extent, divided by the Green mountains into two archæological regions, though perhaps it is not best to make this distinction too prominent. So far as the more recent specimens are concerned, we should expect this to be the case, for, while the early history of Vermont is not very full in its account of the Indians whom the white men found, we are told a few facts respecting their habits, and among other things that those living on the western side of the Green mountains rarely crossed them. For instance, Hall, in his "History of Eastern Vermont," page 585, says: "The Iroquois seldom crossed the mountains, and have left few marks of their presence in the eastern part of the State." He goes on to tell us that, "the country in the neighborhood of Lunenburg and Newbury (in Northeastern Vermont), and on the side of the river opposite to the latter place, was called by the Indians "Coos," which word in the Abenaqui language is said to signify "the Pines." At this point and at other localities on the Upper Connecticut, formerly resided a branch of the Abenaqui tribe. These Indians were called Coosucks, and being defeated in battle by the white settlers in 1725, they went back to Canada whence they had come, and in 1760 a few returned to Coos. As to the extent of this settlement there seems to be no definite information. In a small work published in 1841 by Rev. Grant Powers, entitled "Historical Sketches of Coos County," on pages 39–40 we find the following: "On the high ground east of the mouth of Cow Meadow brook, and south of the three large projecting rocks, were found many indications of an old and extensive Indian settlement. There were many domestic implements. Among the rest were a stone mortar and pestle. * * * Heads of arrows, large quantities of ashes, and the ground burnt over to a great extent, are some of the marks of a long residence there. * * * * On the meadow, forty or fifty rods below, near the rocks in the river, was evidently a burying ground. The remains of many of the sons of the forest, are there deposited. Bones have frequently been turned up by the plow. That they were buried in the sitting posture, peculiar to the Indians, has been ascertained. When the first settlers came here, the remains of a fort were still visible on the Ox Bow. * * * The size of the fort was plain to be seen. Trees as large as a man's thigh were growing in the circumference of the old fort. A profusion of white flint-stones and

heads of arrows may yet be seen scattered over the ground." I have not been able to ascertain the existence of a collection of the above-mentioned implements, and it is probable that like many other similar objects, they were thrown aside by their finders as useless. This is to be regretted, as a collection of stone implements, the locality of which was certain and also the tribe that made and used them, would be of great value to us as a basis of a more definite ethnology than is at present possible, or probably ever will be.

Proceeding now to special groups of objects, we will first examine those implements commonly known as "gouges," and which for convenience will be so designated in the following pages, though, as will appear, it is not the belief of the writer that all, if any, of them were used for the purposes for which our modern gouges are designed. I have chosen this class of implements for description before all others, because, as archæologists well know, they are eminently characteristic of eastern collections, very few having been found in the Mississippi valley and none, I believe, in the mounds, and are especially characteristic of our Vermont collections. It seems probable that the gouge is of comparatively modern origin, and was made and used by such tribes or nations as the Algonkins and Iroquois, and were unknown to more ancient peoples. This implement is not, I believe, common in any other part of the world except the Eastern United States; and even here they are not so abundant as to occur in great numbers in our collections, yet they form an important part of them. Presenting great variety in form, size and material, the gouges seem rather to form a class of implements, some designed for one purpose and some for another, than to be simply different forms of one implement. The absence of gouges from large portions of this country, is the more remarkable because we find so many other implements either in identical or similar forms over all that portion of the United States east of Kansas.

The general character and variety in form and material of the Vermont gouges will best appear in the following descriptions and figures, which include all the different classes which I have seen, though each of these may be taken as a type of which varieties may exist. The gouge described on page 744 of Vol. XIII of the NATURALIST, and figured on page 741, may serve as a type of still a different form from any

here mentioned, and should properly have been embraced in this article.

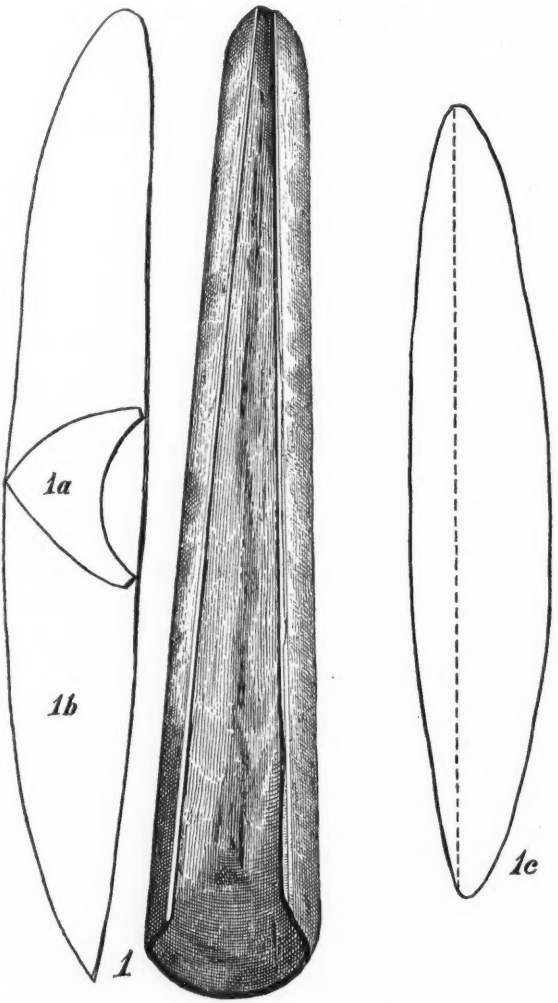


FIG. 1.—Indian "Gouges."

In Fig. 1 we have a representation, reduced one-half, of a speci-

men which has the general characters of the longest gouges that have been found. In all of these the groove runs from end to end, becoming narrower, as does the specimen itself, towards the upper end. One specimen of this sort is nineteen inches in length. The material is always some hard, compact stone, like basalt, which is wrought into the desired form with very great skill. The specimen figured is 11.5 inches long; its form is very symmetrical, and the surface smooth and in some portions polished. The upper surface is mainly occupied by the groove and there is, on each side of this, a narrow flat portion from which the sides curve downward and approach each other until they meet in a median ridge, on the lower side, so that a cross section is of the form shown at 1*a*. The under side is also curved from end to end, bending upwards rapidly to form the edge, so that a longitudinal section is of the form shown in 1*b*. In most of these implements the main portion of the bevelling at the edge is from beneath, though generally the upper surface is also beveled, often abruptly, downwards. The edge in this specimen is very regularly curved, is sharp, and 1.65 inches in width—the width of the opposite end being less than half as much. Near the edge the groove is .5 inch deep, but grows shallower as well as narrower as it recedes from the end. The greatest thickness of the implement is near the middle, where it amounts to 1.5 inch. Other specimens are wider in proportion to the length, for instance, in one case where the length is somewhat more than 9 inches, the width is, in the widest part, 2 inches. In this specimen we find the widest part about a third of the distance from the edge to the other end, and from this point the width decreases somewhat to the edge, and much more to the other end, and the same peculiarity is seen in the thickness, so that a longitudinal section is somewhat unequally fusiform, the upper side curving less than the lower, as seen in Fig. 1*c*. As the line of the groove, indicated by the broken line in the figure, is straight, the depth seems to be greater near the middle than at either end. In cross section this specimen is like Fig. 1*a* except that it is much broader in proportion to the height. Figure 2 shows a unique form of this sort of gouge. The groove is similar to others, though the edge is not straight, but somewhat oblique. The material is basalt and the specimen was evidently formed with much care and labor, although the surfaces are not polished, but show striæ made by sand used

in grinding them. The chief peculiarity of this specimen is in the form of the lower side, which instead of being more or less convex, as in almost all other specimens, is ground in a series of planes, so that in cross section it has the form of *2a*. These surfaces are flat and even, and the edges sharp and true. The groove is very deep and wide. The length of this specimen is 4.75 inches; width, just above the edge, 1.56 inch. This is the only specimen which shows no curved surfaces, except the groove, that I have seen. In some specimens there is a flat space running longitudinally through the middle of the back, but usually even this is convex, or raised into a sharp ridge; many others are flat on the upper side, but in all some of the surfaces are convex. In figure 3 we have another variety of gouge, in which, as in the foregoing, the groove extends throughout the length, but in this case each end is brought to an edge, and the sides do not converge at one end, as in the specimens thus far mentioned, but are parallel, and the groove is of equal width throughout. One end, as the figure shows, is broken. The under side is very regularly convex. The material is basalt, and the surfaces are pretty well finished. The length is 5.65 inches; width 1 inch. Col. Whittlesey figures on page 117 of the "Ohio Centennial Report," what he calls a "gouge-form skinner," which is somewhat like the above, and mentions three other Ohio specimens which he has seen. Although gouges in which the groove extends through the entire length are not uncommon, yet this is not the form of nearly all such implements. More have a groove which extends only a short distance from the edge. Figures 4 and 5 show the opposite sides of one of this

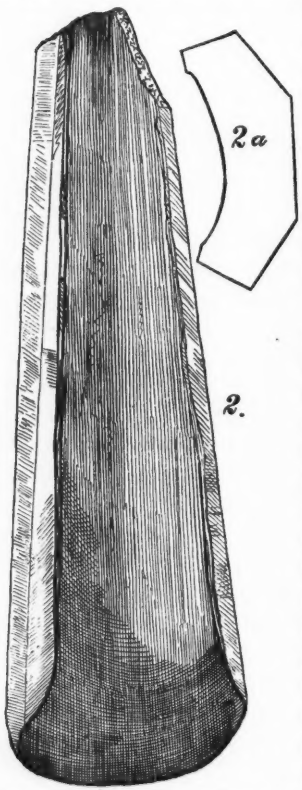
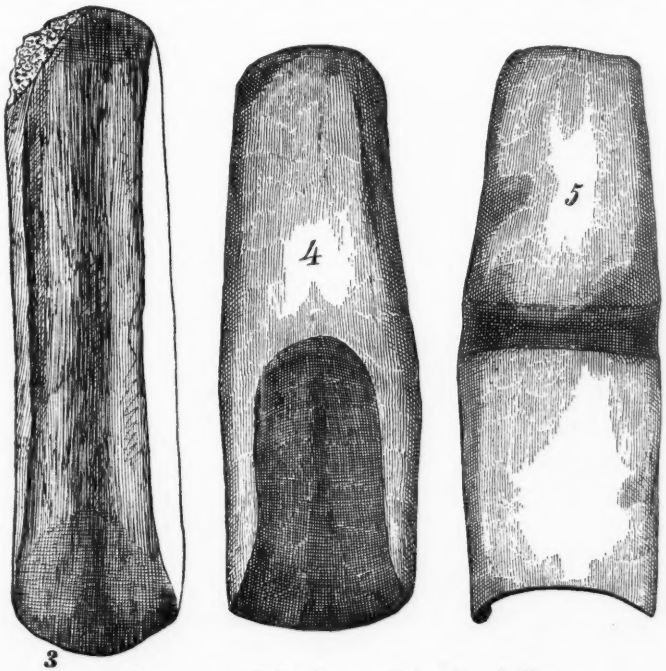


FIG. 2.—Indian Gouge. Reduced ½.

kind. This implement, the general form of which is shown in the figures referred to, is convex on both surfaces, so that a cross

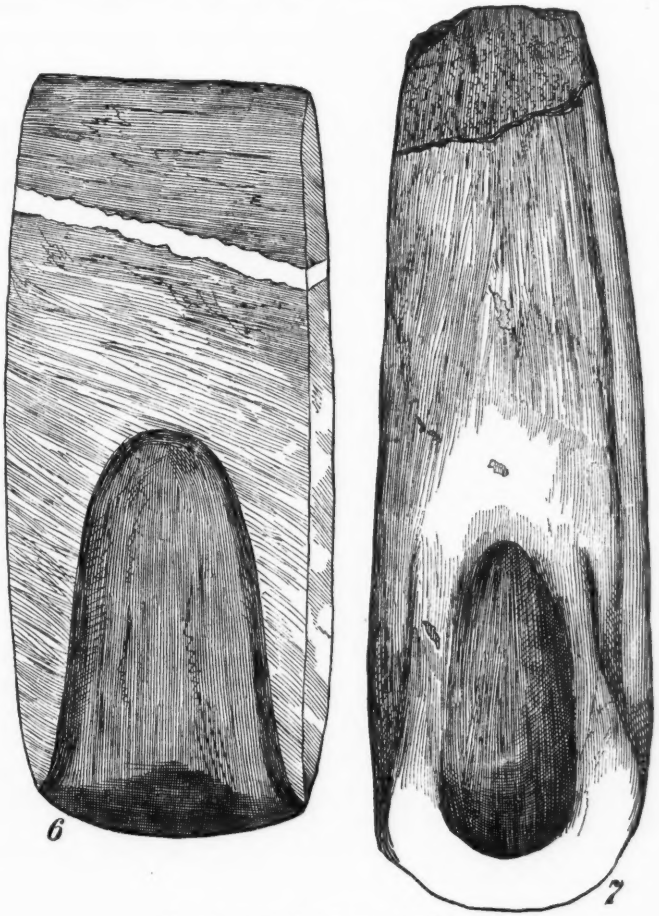


FIGS. 3, 4, 5.—Indian Gouge. Reduced one-half.

section is oval. The groove, regularly rounded above and in every way well formed, is well polished. Indeed, it is scarcely necessary to mention this, for whatever may be the character of the other parts of one of these specimens, the groove, and usually the adjacent portions, is always well finished and polished. As seen in figure 5, this specimen has, across the under side, a transverse groove, which divides it into two nearly equal portions. I have seen one or two other specimens of similar form, which were similarly grooved. Whether we are to regard this as an indication that the implement was attached to a handle and used as an adze or not may not be clear, but it is difficult to account for this transverse groove in any other way. These grooves are not deep nor worked out with as much care as that at the end. The material of this specimen is a gray talcose slate with the sur-

face very smoothly finished. It is worthy of notice that all the specimens with the groove running from end to end are of hard material, such as trap or basalt, while many of those with a shorter groove, like figure 5, are of the talcose rock mentioned. This is not very hard, but readily takes a smooth surface, and when finished, an implement of this material is often very handsome. Some of the gouges of this material are quite large, though none so large as those first named, or rather they are not so long, but the width is often greater. The basalt gouges are more nearly cylindrical in cross section than most of the talcose ones, which are usually but slightly convex. The latter range in length from four to eight inches. Of the same talcose rock is the specimen seen in figure 6. This specimen is somewhat unique in its rectangular outline and great width, as well as in the chisel-like character of the upper end. I have seen several of this sort —gouge at one end chisel at the other. The chisel end is rather abruptly brought to an edge, which is sharp and even, as is the opposite edge. The material is of a bluish color with a vein of white running across the upper portion. The sides are flat and form sharp angles with the upper and lower surfaces, but they are not parallel, but slope so that the surface seen in the figure is narrower than the opposite. The thickness is greatest near the white band where it is nearly an inch, and from here it grows less towards each end. The width is about the same, 1.75 inch throughout. The length is 4.5 inches. The whole specimen is well finished. Figure 7 shows a very singular gouge-like implement of green gneissoid stone. It is of regular form and well made, those parts of the surface that have not been injured being smooth. The surface shown is flat, or nearly so, while the opposite is somewhat convex. As the figure shows, the groove, which is short and somewhat irregular, does not reach to the end, but stops about a fourth of an inch from it, leaving a space which is ground very smooth and quite strongly bevelled from the end of the groove to that of the implement, and the lower surface is bevelled about this edge so that it is thin and sharp. The use of the groove is not at all apparent in this implement, which, judging from its form, was probably used resting on the bevelled portion between the groove and edge with the groove down. The groove is quite deep and well excavated, but somewhat one sided. The length of this specimen is 5.3 inches; greatest width, 1.65 inch; thickness, 1.15 inch. An-

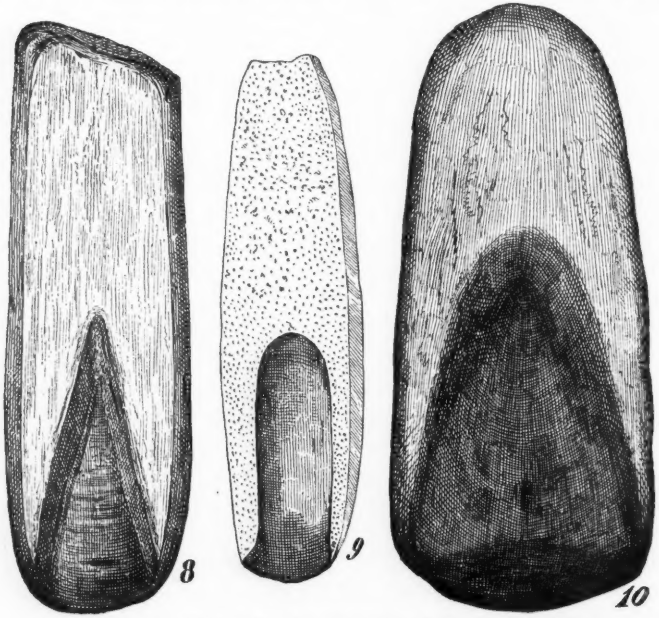
other singular specimen, which should, perhaps, be classed with the above, is quite rudely made of a dark, micaceous rock; it is triangular in outline, being at the edge 1.9 inch wide and growing narrower towards the other end, which forms a blunt point. In



FIGS. 6, 7.—Indian Gouges. Full size.

thickness the reverse is true, as this is over an inch at the upper end, from which it grows less towards the edge. The groove, if it can be called such, is a small elliptical excavation about a fourth of an inch from the edge. This implement probably shows us the

most rudimentary form of the gouge; indeed, it is essentially a chisel with a small hollowed out space on one surface near the edge. The length of this specimen is 5.2 inches. Figure 8 exhibits another type of gouge of which I have seen quite a number of specimens. In these the excavated portion is triangular and not concave, but with straight sloping sides inclosing a space



Indian Gouges. Figures 8 and 9 reduced one-half; figure 10 full size.

nearly or quite flat, and terminating in a more or less straight edge. The upper surface is flat, and from this the sides curve regularly until they meet behind. The thickness is relatively greater than in other forms, and the appearance suggests the thought that the form was at first cylindrical, and the flat upper surface ground down afterwards. The upper end, while not very evenly shaped, is yet ground smooth and finished like the rest of the implement. The specimen figured is shown one-half full size, being 7 inches long, 1.9 wide and 1.5 inches thick. The sides are straight and nearly parallel. The material is a dark steatite, harder than this material usually is. Other specimens are of syenite and porphyry, and are larger than this. Besides the specimens with

triangular groove and parallel sides, as in figure 8, there are other gouges, with somewhat similar grooves, which taper from the edge almost to a point. One of these of the hard black limestone found abundantly in many parts of Western Vermont, is rather rudely finished, the pick-marks being conspicuous. This specimen, which is 8 inches long, has a very wide, short groove, which shows a peculiarity seen to a less degree in other gouges. It is deeper on each side so that a convex portion occupies the median part of the groove, thus affording a hint of the manner in which the excavated portion was worked out, at least in some cases, *i. e.*, by rubbing or grinding out a narrow groove on each side of the implement and then removing the space included between these. It is possible that some pointed hammer or other implement was used in the excavation of the groove, but only a very few specimens indicate this in any way; in nearly all, the smooth surface, sometimes striated, suggests that the whole was ground out by using sand with some cylindrical instrument. In one specimen, in which the groove is triangular, though concave transversely instead of being flat, as in the above, we find the upper end brought to a chisel edge somewhat like that shown in figure 6, though this latter is much less highly finished, indeed, its material, a sort of mica schist, precludes much elegance in the finish. It is a small implement, being but 4.25 inches long. Both surfaces are flat, and the sides rounded. Figure 9 is a fine specimen, made of a compact, mottled stone of a greenish hue. The surface is smooth, though not polished, except near and in the groove. The surface shown is flat and the edges along the sides are sharp. The lower surface is convex. As is often the case, the thickness is greatest, 1.8 inch, near the middle, and from here the under surface slopes to each end. The form of the groove and of the specimen itself may be understood from the figure. This is a large gouge, as it is 9 inches long and 1.65 inch wide at the edge. The upper end is somewhat rude, but all the rest shows that much care was exercised in making it. There is a species of gouge which is found in various parts of the State quite unlike any of those mentioned. The implements of this sort are of small size with a blunt, rounded edge, wholly unfitted for cutting or even scraping. In some cases, perhaps, this thickness of the edge should be regarded as the effects of use, but it is so regular and of such a character, that I have no doubt that it was

intended to be so. Figure 10 shows one of this sort. The material of all is rather soft, and the surface is not ground so smooth as in many gouges of other forms. The groove is shallow, long and wide, and, as has been noticed, the edge is not sharp. The surface shown is flat, the lower regularly convex. The length of this specimen is 3.5 inches, width across the edge, 1.6 inch, and the thickness in general about .5 inch, though in places more. Still farther removed from gouges with cutting edges, are specimens with a very shallow groove, and with the grooved end not brought to an edge or anything like it, but only worked somewhat thinner than the rest of the implement and then evenly rounded. These are made from talcose or schistoze rocks and hence are not very hard.

A comparison of the figures given with these pages will make evident several facts worthy of notice. As the reader has probably discovered, I have included under the name "gouge" a variety of specimens, some of them without very much in common, but it has seemed more convenient to do this than to attempt a subdivision of the group into classes. The term groove has also been for the same reason used to designate the excavated portion of each implement, whatever its character may be. We have seen that in some the edge is straight, in others curved, in some concave, in others flat, and the groove is found in all gradations between a very simple, oval depression and one elegantly wrought and extending through the entire length of the specimen, as in figure 1. In most, the lower surface, by which is always meant that opposite the groove, is convex, both transversely and, to a less degree, longitudinally, though in a few cases the thickness is greatest, not near the center, but at the upper end. This end in nearly all specimens is narrower than the other. In many specimens this end is rough and broken, or splintered, but not in all, for there are specimens in which this end is as smooth as any part of them.

A gouge in which the edge shows signs of hard usage is very uncommon. These facts must be considered when we attempt to discover the purpose for which these implements were designed. I have searched the writings of Champlain and other early explorers for some mention of these implements, and some hint as to their use, but thus far in vain, and without some such aid, theorizing upon the use of these, or any other such implements is of

little value. The most plausible theory for the use of the gouge, is, perhaps, that it was the chief implement used in excavating dug-out canoes. Champlain gives a very brief account of the manner in which some of the Indians whom he met on the coast of Maine, made canoes, and tells how by charring and scraping away the charred wood and again charring it, the desired form was obtained, but he does not give us any definite idea of the form or character of the stone implements with which the work was accomplished, and we know that in many parts of the country, canoes were chiefly made of elm or birch bark. Evans seems to incline towards this view in speaking of the "hollow chisels" of flaked flint found in Denmark, and far less abundantly in England, as he states that they are found chiefly where canoes would be most likely to have been used. We also learn from old writers that gouges made from the columella of the conch, were used by southern tribes for scraping away charred wood in making canoes, and Evans, quoting another, says: "On the western coast of North America mussel shell adzes are still preferred by the Abts to the best English chisels for canoe-making purposes." Bone gouges are also common in the south, more so, according to Col. Jones, than those of stone. I have never seen any other than a stone gouge in Vermont. That some of the specimens figured, or such as they, were thus used, either held in the hand or attached to a handle as adzes, is quite probable, but that all were so used does not seem so. Another theory has been suggested, that the gouges were intended for use in tapping maple trees in the sugar making operations of the aborigines. I cannot see any basis of probability for this theory to rest upon. If this view were correct, we should find gouges most abundantly near those places where the sugar maple is most abundant, but this is not the case, at least in Vermont. On the uplands where the sugar maple now grows, and has for a long time, we do not find gouges as we do on the lowlands and meadows. While the form of such a gouge as that shown in figure 1 might suggest such a use as that just mentioned, the form of most would certainly be a strong argument against such use, and the material of which many are made is such as to unfit them for cutting hard wood such as that of the sugar maple. It is a remarkable fact that so many of our gouges appear to have seen so little service. It would seem certain that implements requiring so much labor for

their formation, and made with such care, must have been designed for some important service, but even those of the comparatively soft talcose rock have as sharp and apparently unused edges as if just made, the polished groove and edge often not showing even a scratch or notch. Some of them are worn, especially some of the smaller specimens, but most are not. Another noticeable fact, which perhaps might be less so in a larger collection, is that each specimen has certain peculiarities of its own, so that it is quite difficult to find duplicates, though they do sometimes occur, but each specimen seems to have been made according to the present fancy of the maker, and this appears to have varied somewhat as each new specimen was undertaken. This variety in form, size and material indicates that the gouge was not an implement designed for a single, limited use, but that, whether we can ascertain the use of the various kinds or not, their uses were as varied as their form and material. Gouge-like implements have been figured as skin dressers by some authors, and this, it seems to me, suggests better than anything else the probable explanation of the character of these implements. If used in cleaning adhering bits of fat or muscle from the skins so generally in use among the aborigines, the edge would remain unworn for a long time, even if the implement were made of no very hard material. It may not improbably be true that some were used in excavating the charred portions of a log selected for a canoe, but it seems more probable that most were used, in one way or another, in the processes of preparing skins for clothing or for whatever other purposes the skins may have been needed.

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LARVAL HABITS OF BEE-FLIES.[1]

BY C. V. RILEY.

THE bee-flies (Bombyliidæ) are a family of Diptera that have a rapid, darting flight and hover over flowers, from which they extract nectar by means of a long proboscis which is a characteristic of most of the genera. They derive their popular name of bee-flies, or humble-bee flies, from their general resemblance to bees, due to the hairiness of the body, and enhanced by

[1] Adapted from the Second Report of the U. S. Entomological Commission, to which the publishers are indebted for permission to have impressions of the plate made at their expense.

the humming which they produce in flight. Nothing had been published of their larval habits in this country till last year, though an undetermined larva, at first supposed to be Hymenopterous, but which subsequently proved to be that of Systœchus, was figured in the writer's ninth report on the insects of Missouri (1877), and copied in his "Locust Plague in the United States," and into the First Report of the U. S. Entomological Commission.

In October, 1879, we obtained from a lot of larvæ sent us by Mr. G. M. Dodge, of Glencoe, Neb., a single pupa which agrees with those of *Systœchus oreas* O. S.,[1] presently to be described, but which, as Baron Osten Sacken writes us, is probably that of *S. vulgaris*, a common species in the Western States, east of the mountains.

During the past two years we have been in correspondence with Professor J. G. Lemmon, of Sierra Valley, Cal., who has kindly sent us many specimens of locusts occurring there, and especially the eggs and early stages of *Camnula pellucida.*

Among such eggs these bee-fly larvæ were, if anything, more common than we had found them among the eggs of the destructive locust, *Caloptenus spretus*, east of the mountains. We here quote one letter in illustration:

"By this mail I dispatch another cigar box filled, this time with sods containing eggs of the terrible locust that for three years past has devastated Sierra Valley; also the large, fat, white larva that lately made its appearance as a voracious feeder upon locust eggs. We don't know certainly what this larva becomes, but at a venture he is hailed with great joy.

"The ground that was first filled with locust eggs by the *Œdipoda atrox*, by the end of September looked as if scattered with loose shells, so thorough was the work of destruction.

"A few of them were detected in among the eggs in April, but not generally until August. One individual seems to empty several egg cases before retiring from the feast and coiling himself up in a case which he has emptied, or in a nidus of his own make."—[J. G. Lemmon, in letter to C. V. Riley, October 12, 1879.

During 1878 and 1879 we failed to rear any of them to the perfect state, but on June 20 of the present year, 1880, we obtained from these California larvæ the first fly. This proved to be a male of *Triodites mus* O. S.,[2] as kindly identified for us by Mr. S. W. Williston, of New Haven. We have, during the sum-

[1] Western Diptera, p. 254; Bull. Hayden's Geol. and Geog. Survey, III, No, 2.

[2] *Ibid*, p. 246.

mer reared many additional specimens of this species, and also of the *Systœchus oreas* O. S., already alluded to. Professor Lemmon and his brother, Mr. W. C. Lemmon, have also succeeded in obtaining the mature flies, and have observed this Systœchus abundantly buzzing about over the ground in which the locust eggs were laid, as the following extracts from the correspondence of these gentlemen will show:

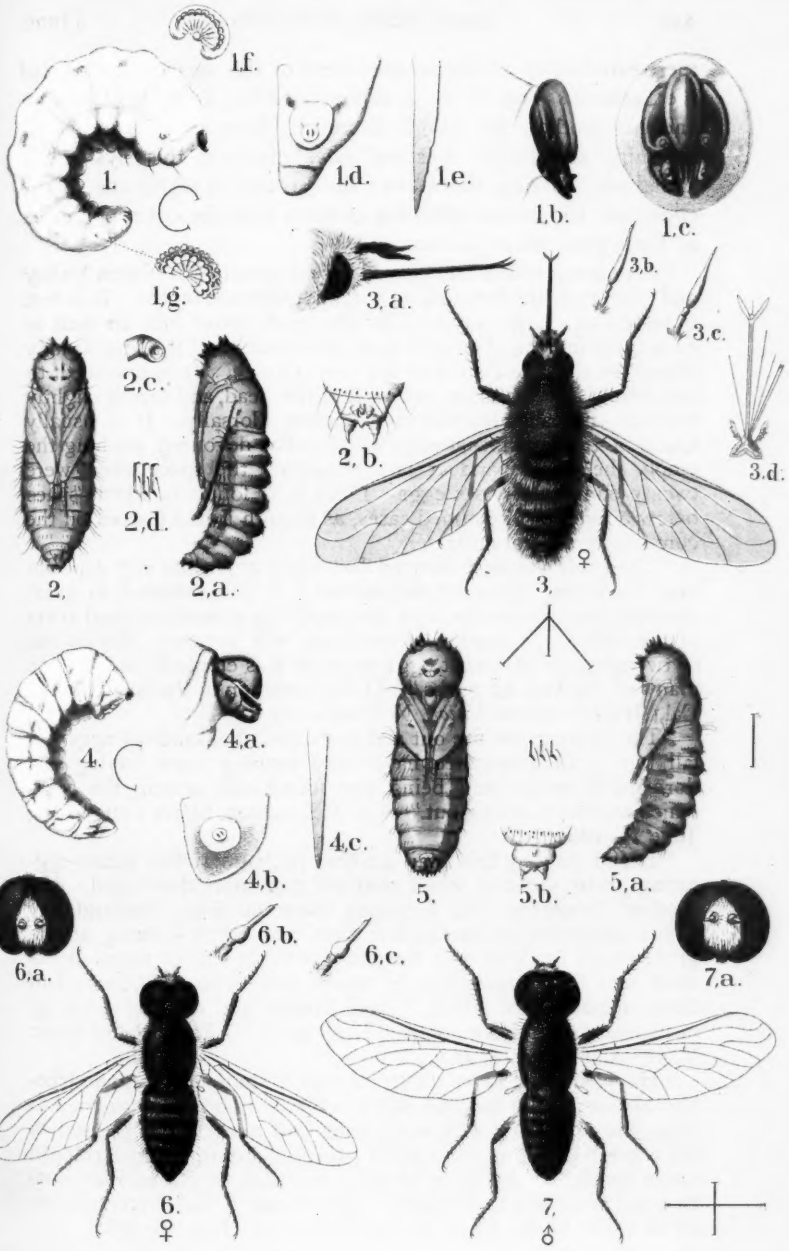
"An enemy which has proved very destructive in Sierra Valley and vicinity is the larva of, as yet, an unknown insect. It is first observed as a large yellowish-white grub about half an inch or even three-fourths of an inch long when extended, it being usually curved so that the head and tail nearly touch. It is one-sixth to one-fifth of an inch thick just back of the head, and tapers slightly towards the tail, also flattened slightly dorsally. It is usually found in a case of locust eggs which it has devoured, pushing the empty shells aside, and at last occupying the space where were twenty-one to thirty-six eggs. Often it is found in a little space below a number of emptied cases, as though it had feasted off the contents of several nests.

"The grub was first noticed last April 20, in the egg deposits near Loyalton. This fall, September 7, it was detected in great quantity near Sierraville, and afterwards in several infested spots of the valley. A handful of such soil will generally display ten to twenty cases of locust eggs, more or less emptied, and half as many of the fine, fat grubs."—[J. G. Lemmon in the Sacramento, Cal., *Weekly Record-Union*, November 29, 1879.

"The white grubs ate out and destroyed thousands of eggs last fall, but, to all appearance, have eaten nothing since, having lain dormant all winter, and being now found still among the eggs, which are fast hatching out."—[W. C. Lemmon, Sierra Valley, Cal., June 13, 1880.

"I send you by this mail another package of the locust-egg-eating grubs, some of which you will find more developed. My brother, Professor J. G. Lemmon, came up from Oakland day before yesterday to spend a few days, and while looking at the grubs that I had gathered for you yesterday, one of them developed into the humble-bee fly which you have bred, and a half dozen specimens of which I have caught and envelop rolled up in paper."—[W. C. Lemmon in letter to C. V. Riley, dated Sierra Valley, Cal., July 18, 1880.

"Happening home on a hurried visit, I find locusts and destruction all around—a sad, sad sight! Find my brother has tried to keep you posted up with specimens and notes. Am pleased to see a solution of the "big white grub" question. He developed into a species of fly, hosts of which are now seen in midday, buzzing about among the locusts."—[Professor J. G. Lemmon in letter to C. V. Riley, dated Sierra Valley, Cal., July 18, 1880.



C.V.Riley del. et pinx.

BEE-FLIES.

A.Hoen & Co. Lithocaustic. Baltimore.

This habit in the larvæ of Bombyliids of preying on locust eggs has not before been suspected, and in this connection we will review what has hitherto been known of their habits.

Professor J. O. Westwood has given, in the Transactions of the Entomological Society of London, 1876, pp. 497, 498, the following summary of observations upon the larval habits of Bombylii:

"Thanks to the researches of previous observers, the economy and transformations of the Bombylii are now satisfactorily known to entomologists. Latreille rightly considered that the Bombylii, like Anthrax, were parasites, contrary to the opinion of Zetterstedt that the larvæ feed on the roots of plants (Ins. Lapp., p. 510). The pupa of *Bom. major* was first figured by M. Imhoff, in the *Isis* for 1834, having been found by him in a situation which he had previously noticed to be frequented by *Andrena humilis* (Vol. 1834 p. 536, pl. xii). In my Introduction (Vol. II, p. 538, 1840) I published a figure of the same pupa from a specimen discovered by M. C. Pickering in a sandy gravel-pit at Coombe Wood, on the 28th of March, from which the imago was produced in a few days. The pupa is very similar to those of the species of Anthrax, which are known to be parasites, having the front and under side of the head armed with strong spines, and the dorsal segments of the abdomen furnished with transverse rows of strong reflexed hooklets. In 1852, M. H. Lucas published the description of a new Algerine species of the genus, *Bomb. boghariensis*, in the Annals of the French Entomological Society, 2d ser., Vol. x, p. 11, pl. 1, No. 11, which he had reared from a pupa found under a stone in a damp, sandy situation, and, contrary to the opinion of Latreille, he expressed himself thus: 'Je suis porté à croire que les larves qui composent ce genre ne sont pas parasites, comme le supposent Latreille et beaucoup d'autres Entomologistes, mais qu'elles vivent au contraire isolément dans la terre,—opinion, au reste, qui avait déjà été émise, mais avec doute, par M. Macquart, et que mon observation vient confirmer.'

"In 1858, the real history of the Bombylius was discovered by the veteran Léon Dufour, who in the spring found various exuviæ of the pupa of *B. major* sticking out of the ground, together with the newly-hatched insect, in places much frequented by various Andrenidæ, especially in the autumn, by digging on the spot, to find the larva, 'au milieu des déblais, où gisaient par-ci par-là des coques de Colletes' (Ann. Soc. Ent. France, 3d ser.. tom. vi, p. 505, pl. 13, Fig. 111, and details). The larva is elongated, apod and fleshy, and of a white color. The preceding observations clearly prove that the larvæ of the Bombylii are parasites in the nests of other insects, in the manner of the cuckoo among birds."

The last statement of Professor Westwood is, however, not justified by Dufour's observations. On the contrary, Dufour ex-

pressly states that he did not observe upon what the larva fed; the inference which he draws is based upon the analogy of Anthrax, and he inferred that it was upon the larvæ of Colletes that the grub fed; quite a different thing from being a cuckoo in the nest and feeding only upon the pollen. There is, in Dufour's paper, no evidence to prove that the Bombylius larva was found in the coccoons, or even in the cells of the bee; he states, in fact, that he failed to find it there, but found it among the clearings *(déblais)* which he had made in digging out the nests. Professor Westwood himself found numbers of *Bombylius medius* flying in association with a species of Andrena in the unpaved Forum Triangulare of Pompeii, and found at the same spot the pupa-shell of the fly protruding from the ground.

As early as 1838, Macleay (Ann. N. H., Vol. II, p. 12), stated that he had "discovered that the larvæ of those tropical Bombylii which have such a bee-like form live on the larvæ of the bees they so strikingly represent," although he gives no particulars of his discovery.

Dr. Morelet, in 1854, recorded the fact that he had obtained a Bombylius from a nest of *Halictus succinctus* (Bull. Soc. Ent. de France, 1854, p. XXIV).

Dr. Packard ("Guide," &c., p. 397) states that "a species [of Bombylius] is known in England to lay its eggs at the opening of the holes of Andrena, whose larvæ and pupæ are devoured by the larvæ of the fly." But no authority is given for this statement.

Messrs. Allen and Underhill, in *Science Gossip*, 1875, p. 80, express their belief that the Bombylii are parasitic on humble-bees. In the volume for 1876, p. 171, they say (speaking of Sitaris):

"In relation to the larva of this beetle, we would remark that this year we have found it clinging to Bombylii. This is 'circumstantial evidence' that Bombylii frequent the nests of Anthrophora to lay their eggs, since Sitaris itself, from its manner of life, cannot be the parasite of a fly, but only of a bee."

Schmidt-Goebel, as Baron Osten Sacken has pointed out,[1] reared one of the smaller unicolorous Bombylii from among the pupæ of *Colletes fodiens* (Stettiner Ent. Zeit., 1876, p. 393), which so infested a clayey bank that he could not place his thumb anywhere without discovering an entrance to a burrow.

Finally, Dr. T. Algernon Chapman *(Ent. Monthly Mag.*, Feb.,

[1] *Entom. Monthly Mag.*, Feb., 1881, p. 206.

1878, p. 196), as shown in the February number of the NATURALIST, gives abundant proof of the parasitism of *Bombylius major* on *Andrena labialis*.

From these records of European observations, it is sufficiently certain that some of the Bombyliids develop in the cells of mason and burrowing bees, but whether as true parasites on the larvæ of the bees or as partial parasites on the pollen-paste stored up by the same, as in the case of the larvæ of some of the Meloids, does not seem to have been observed. The former is most probably the case, however, for it has been clearly ascertained, and is well known, that Anthrax feeds in the larva state upon the young of certain bees. The larva of the Anthrax before attaining its own full growth and before destroying its host must await the full growth of the latter, as it has, by several observers, been bred from the cocoons of the insects upon which it was parasitic.

In his "Western Diptera" *(l. c.* p. 243) Baron Osten Sacken gives references to the published account of the parasitism of the Anthracid genus Argyramœba within the nests of Cemonus and Chalicidoma; cites Schiner's statement that the larvæ live parasitically in pupæ of Lepidoptera, and records the breeding of *A. cephus* and *A. fur* from the nest of a Texan mud-wasp, which he referred, with a question, to Pelopœus, but which, as we have ascertained from an examination of the mud tubes which are deposited in the Cambridge Museum of Comparative Zoölogy, belong to Trypoxylon. We have similar cells from Texas and other parts of the South. They differ from those of Pelopœus in being wider, ribbed on the upper surface, and fastened not only side by side, but in long tubes, end to end. The Pelopœus spins a thin, yielding, semitransparent, elongate cocoon of a golden-brown color, with more or less loose silk around it, and the tail end thickened and docked; the Trypoxylon spins a tougher, thicker, more solid and smooth cocoon of a dull, dark-brown color, generally about half as long as the other (but varying greatly in size), and with the head-end often expanding into a flange.

We have reared what is very near to and probably identical with *Argyramœba fur* from larvæ that had preyed on *Trypoxylon albitarse* which had made use of the mud cells of *Pelopœus lunatus*, or the common mud-dab, in Texas; also from the same

wasp that had made use of the burrows of a bee (*Anthophora abrupta* Say). The larva of Argyramœba has very much the same appearance as that of Systœchus and Triodites, and the pupa is distinguished from the pupa of this last (Pl. VI, Figs. 5, 5 *a*), principally by its longer and more numerous hairs, longer anal spines, and more conspicuous spiracles.

Systropus also, in the larva state, preys on the larva of Limacodes, as has been observed by Walsh (Proc. Bost. Soc. N. H. IX, 300), and by Westwood (Trans. London Ent. Soc., 1876, p. 571), killing its victim only after the latter has formed its tough cocoon.

With these general remarks, we will now give a more full and descriptive account of the two bee-flies which, by rearing from the larva, we know to have this locust-egg-feeding habit. Our plate illustrates the insects as well as can be done in color printing, but the enlarged heads of the larva should be somewhat darker and less yellow.

SYSTŒCHUS OREAS.—The character of the eggs and the manner in which they are laid have not yet been observed. The larva (Pl. VI, Fig. 1) is found in the locust egg-pods, or near them, of different sizes, during most of the year. These larvæ begin to transform to the pupa state early in the summer, and the pupa (Pl. VI, Fig. 2) pushes itself half way out of the ground in order to disclose the fly. These flies continue to issue during the summer months. As a rule, but one year is required for full development, but there is, in this respect, great irregularity, and the same tendency to retardation which we have called attention to in the case of the blister-beetles.[1] We have had quite a number of the larvæ remain over unchanged till the second year, and all that we have said as to the philosophy of this retardation in the one case applies in the other.[2] We are inclined to think that future obser-

[1] *Am. Entomologist*, III, 196.

[2] This irregularity in the development of individuals is noticeable in many insects that are parasitic, and whose mode of life is precarious. In the case of our blister-beetles, depending as they do on locust eggs, and especially in the case of those which feed particularly on the eggs of migratory species, it is not difficult to perceive how this trait may prove serviceable to the species possessing it. Migratory locusts occur in immense numbers, in some particular part of the country, at irregular intervals, and there are periods or years of absolute immunity from their presence in the same regions. The young blister-beetles that hatch the year following the advent of the locusts in immense numbers may frequently find few or no locust eggs upon which to prey, and the great bulk of them would, as a consequence, perish; while the young from such exceptional individuals as should not develop till two, three, or

vation will show that there is a still further parallel, in that the newly-hatched larvæ of the bee-flies are much more active than the later stages, and somewhat different in structure.

The three later stages of the insect may be characterized as follows:

Larva (Pl. VI, Fig. 1).—We quote herewith our former description:

"Average length, 0.50 inch. Body curved, glabrous, tapering posteriorly, swollen anteriorly. Color opaque whitish, with translucent yellowish mottlings, and some venous marks at sutures, especially along medio-dorsum. Sutures deep. A lateral row of swellings. Head small, flattened, dark brown, in five pieces, consisting above of a frontal ovoid piece and two lateral pieces of somewhat similar form, and each bearing near tip a minute, two-jointed palpus; beneath of two broad, subtriangular jaws, having forward and lateral motion, and each, also, bearing near the center, in a depression, a two-jointed feeler. A spiracle each side in a fold between joints 2 and 3, and another on each side of the penultimate joint, 12. None otherwise perceptible."

With additional material we have been enabled to examine more fully the structure of the head. Underneath the median elevated piece which may represent the labrum, we find two stout spines (Pl. VI, Fig. 1 *e*), faintly notched on the outer edge, which are doubtless the mandibles, and correspond to the two dark lance-like mandibles of other Dipterous larvæ, for they are retractile and run back into the thoracic joints, and remain after the other trophi are detached. The pair of feelers upon the upper lateral pieces, which seem to have no motion, might then represent the antennæ, and the two lower jaws the maxillæ with their palpi, while the labium is shown in a chitinous point visible only when the larva extends and raises the other parts. A peculiarity in the movement of the maxillæ or the lower pair of horny pieces is worthy of note. They move in alternation with one another in the forward and backward, *i. e.*, up and down, motion. The palpus of these lower pieces when viewed from above is, as represented in the figure (Pl. VI, Fig. 1 *d*), circular, with two dark marks indicating minute appendages.

When the larva is fresh and plump it shows the greater swelling of the thoracic joints and the translucent mottlings mentioned

more years after a locust invasion might stand a much better chance of finding appropriate food, and of thus perpetuating the species. In this case and in most other cases of retarded development with which we are familiar, the exceptional retardation may and does become a benefit to the species, enabling it to bridge over periods of adversity. And we can see how, by the preservation of such favored individuals, the habit of irregular development may have become fixed in the species as a consequence of surrounding conditions and circumstances which render it advantageous.

above. Toward the period of pupation, it becomes more opaque and more contracted.[1]

Pupa (Pl. VI, Fig. 2).—Average length 8.5 mm. Color honey-yellow, but varying with age, the head and thorax assuming a dark color with maturity. Head narrow, with two sets of three stout, dark spines on the top, all on a common prominence, the two lower ones of each set connected at base; a pair of smaller frontal spines near the base of proboscis, which is protuberant and laid along the breast, extending to near the tips of the wings; the face with two parallel depressions running from between the triple tubercles ending in two fossæ above the frontal spines; two basal, medio-dorsal tubercles. *Thorax* unarmed, the prothoracic spiracle very large and raised on a curved tubercle; mesothoracic spiracle on a swelling at base of wings; front tibiæ stout and curved; front tarsi reaching to tips of wings; middle tarsi to abdominal joint beyond, and hind tarsi to third abdominal joint beyond. *Abdomen* curved, with the ninth joint very small; across the middle, dorsally, each joint has a series of parallel, longitudinal, narrow, chitinous plates having at each extremity a spine, the posterior one stoutest; both plates and spines diminishing laterally, gradually aborted on the extreme basal and posterior joints, and replaced on the small ninth joint by a group of four converging and truncate tubercles; two stouter anal spines on the subjoint and a ventral lobe with two short, obscurely articulate processes; each abdominal joint with a circle of hairs, those on lateral ridge stoutest and one-third the width of abdomen in length; eight pair of abdominal spiracles (making ten with those on thorax), the first and last pairs rather difficult of detection.

TRIODITES MUS.—The habits of this insect in the larva state are precisely like those of the preceding.

Larva (Pl. VI, Fig. 4).—So greatly resembling that of the Systœchus that it is well nigh impossible to separate the two with certainty. The head parts are somewhat broader, shorter and less flattened, the maxillæ more blunt, the labrum paler, and the mandibles sharper and with a smoother outer edge. The thoracic joints bulge less beneath and the thoracic spiracle is more sunken and less conspicuous.

Pupa (Pl. VI, Fig. 5).—Easily distinguished from that of Systœchus in the broader and more bulbous head; in the two sets of three stout spines at top being well separated; in the frontal pair be-

[1] So far as we can ascertain, there has hitherto been published no recognizable figure of the Bombyliid larva. Dufour, in his articles above alluded to, describes that of *Bombylius major* very indifferently, and gives a dorsal view which shows little or no relation to the larva here described, while his description and figure of the mouth parts fail to indicate the different pieces we have observed in our larvæ. Yet in general form and structure the true Bombylius larva agrees very closely with those here described, as we know from Dr. Chapman's description.

ing stouter, each with a conspicuous bristle externally; in having a single spine or tooth above these, and another much stouter, erect, recurved spine, bidentate at tip, below them or at base of tongue, which is here represented by a cordate lobe. There is a spine on the front anterior border of each wing; the legs are all shorter; the prothoracic spiracles less conspicuous; the hairs on abdominal joints shorter; the transverse dorsal teeth smaller and in single row; the basal abdominal joint without spines, but with long stout hairs and the dorsal tubercles of abdominal joints nine replaced by a single spine.

EXPLANATION OF PLATE VI.

(Natural sizes indicated in hair-line.)

FIG. 1.—Larva of *Systæchus oreas*, from the side; 1 *b*, head from side, still further enlarged; 1 *c*, same from front; 1 *d*, left maxilla; 1 *e*, left mandible; 1 *f*, mesothoracic spiracle; 1 *g*, pre-anal spiracle.

FIG. 2.—Pupa of *Systæchus oreas*, ventral view; 2 *a*, same, side view; 2 *b*, dorsal part of anal end; 2 *c*, prothoracic spiracle; 2 *d*, form of dorsal horny plates and spines on the abdomen.

FIG. 3.—*Systæchus oreas*, ♀; 3 *a*, head of same from side; 3 *b*, antenna of same from above; 3 *c*, antenna of same from side; 3 *d*, mouth parts separated.

FIG. 4.—Larva of *Triodites mus* as it appears when contracted prior to pupation; 4 *a*, head from side; 4 *b*, left maxilla; 4 *c*, left mandible.

FIG. 5.—Pupa of *Triodites mus*, ventral view; 5 *a*, same, side view; 5 *b*, dorsal view of anal parts; 5 *c*, form of dorsal plates and spines on abdomen.

FIG. 6.—*Triodites mus*, ♀; 6 *a*, her head, front view; 6 *b*, her right antenna from above; 6 *c*, right antenna from side.

FIG. 7.—*Triodites mus*, ♂; 7 *a*, his head, front view.

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LATE EXPLORATIONS IN THE GABOON.[1]

BY HUGO VON KOPPENFELS.

TOWARDS the end of last year I again had the good luck to kill an almost full-grown gorilla, whose length was 1.75 meters, and the width of the shoulders 0.89 meters. This gorilla, and a young female, should, by this time, be in possession of Dr. V. von Kraus, Stuttgart. I, by chance, shot the male gorilla in the vicinity of my stopping place on the Eliva-Comi (an inland lake), so that I was able to take a very good cast of it. I hope to be able to take a cast of the next animal I shall kill, but I cannot predict at what time and place I shall get a full-grown male gorilla, and whether the circumstances will allow me to take a cast of him.

[1] From a letter to Mr. H. A. Ward, Rochester, N. Y.

I have already asserted, and I believe it is proved, that there are crosses between the male *Troglodytes gorilla* and the female *Troglodytes niger*, but for reasons easily understood, there are none in the opposite direction. I have in my possession positive proof of this. This settles all the questions about the gorilla, chimpanzee, Kooloo Kamba, N'schigo, M'bouvé, the Sokos, Baboos, etc.

The French savants seem to have a special predilection for creating new species from variations in the form of the skull, such as often occur in this group of animals.

There is but one district which forms the range of the gorilla, and this is situated in the western part of equatorial Africa, and here it exhibits no varieties, while the chimpanzee is found all over tropical Africa, and naturally exhibits considerable variation. The chimpanzee of Northern Guinea differs essentially from that of the southern portion of the same country, and, according to Livingston, the "Soko" differs from both, but is still a chimpanzee. Du Chaillu's Kooloo Kamba, N'schigo and M'bouvé are not distinct species, and this traveler, who is certainly a man of merit but is too credulous, has been imposed upon by the mendacity of the natives, which beggars description. The names N'schigo, M'bouvé, Koola, Baboo, Soko, Quia and Kooloo Kamba are only different designations of the chimpanzee by different tribes. The mongrel progeny of the male gorilla and female chimpanzee discovered by me, is found, but in individual cases, and as such deserves no special name.

I intend in a few days to start on an excursion to the Crystal mountains over the N'tampuny falls. My purpose is primarily to shoot elephants. Du Chaillu's journey to the Oschebas by the Munin-Tampnay did not extend far, as I accomplished, last year, the same distance in six days' marches. I found the population harmless though somewhat suspicious. The whole district is almost unknown, as I encountered, the second day, members of entirely new tribes on the Yoko, Manga and later the Akuke. The population of this region is continually migrating from the north-east to the south-west, and no one will ever succeed in sifting out the relationship of these commingling tribes.

As a point of departure for penetrating the interior from the west, this seems to be one of the most promising. In all directions are districts which are as yet entirely unknown. On the

north one could in a short time reach the Buiné, a tributary of the Niger; at an equally short distance in a south-easterly direction, one would reach the Sihari, which empties into Tode lake. The district which it drains also forms the water shed of some of the tributaries of the Congo. Had I the means I would not hesitate to begin this important and promising exploration. With a fund of only $10,000, I would venture upon the undertaking.

From what I have been able to learn, I am led to believe that the mountains of the interior consist of three parallel chains running from N.N.W. to S.S.E., having an average height of about 400 to 500 meters. With the volcanic cone of Cameroon 3600 meters high, and which stands opposite Fernando Po, begins a line of elevation which takes a more southerly direction, and with its continuation south of the Ogowé, the Sierra Compleda, forms the border or palisade mountain range of West Africa. In these mountains, protrusions of granite, generally micaceous, are everywhere visible. Adjacent to this is a reddish-yellow sandstone and slate, often succeeded by a hard gray granite. On the table lands and in the valleys I have observed hard quartzose sandstone of varied colors, elsewhere a light gray quartzite with veins of glassy quartz, and large tracts of crystalline slate. The outcrops of all these strata follow the line of bearing of which I have spoken above. The dip of the layers is different in different places, but is generally eastward at a high angle.

Floods do not occur here as the Muni is formed by the Congu-O'tongo, Banji, Tampuny and Noya, all of which with the exception of the latter are short, because the mountains come so near to the bay; but the Noya flows through a plain in a broad curve parallel with the shore of Corisco bay. Toward the Munda, and with this river the Como and the Rembo—both of which empty into the Gaboon—receive their waters from the Crystal mountains. This chain forms the water shed between these rivers and the tributaries which flow northward into the Ogowé.

The mountains south of the Ogowé, and which run parallel with the Loango coast, have the same general character as the Crystal mountains, but have more bog iron ore on the woody slopes than they, and contain less quartz.

In the rapids of the Ogowé, near Ogota and Okanda, the rocks consist of gneiss which weathers into wonderful imitative forms.

On the Eliva-Comi and the Sette-Comi, Nyangu, which owe

their origin to the sand heaped up along the shore by the very strong surf, we find, among transported stones, roundish masses of quartz which, when broken, show the most beautiful quartz crystals.

The effect of the tides is felt in the labyrinthine estuary of the lower river districts as far as forty miles into the interior. Here the tides act like a dam checking the flow of the rivers, which in the rainy season rise four or five meters, and thus all the adjacent country for many miles is inundated.

With the exception of a few higher points where forest trees grow, the vegetation of this swampy lowland consists mostly of thickets of mangrove, from whence comes, under the stimulus of the tropical sun, the *aria cativa* (malaria) so fatal to Europeans. It is extremely dangerous to travel through the districts where the air is impregnated with poisonous exhalations, and efficient prophylactic measures must be taken if one would escape. It has been my custom to take for this purpose one or two doses daily of quinine, and to wear a respirator of fine wire gauze over my mouth. In the evening I bathe the entire body with salicylic acid mixed with a few drops of spirits of ammonia and of glycerine.

Further up the stream, and beyond the mangroves, and where the water is less saline, we find the Pandanus, the wild date palm *(Phœnix spinosa)* and the trunkless Raphia, which forms tangled thickets. All these plants, as well as the Bombax *(Eriodendron anfractuosum)*, though the latter least, endure the brackish water, but grow quite as well where the water saturating the soil is fresh. On banks which are not reached by the high water, the Bombax rises to a respectable height, and can be seen from a great distance overtopping all the associated plants. This tree throws out strong buttresses which reach up to one-third of the height of the trunk, protecting it from fracture to which its tender wood would be exposed as well as from being uprooted. The above mentioned palm trees and Pandanus form the foreground to the forest of tall trees which covers the highlands of the interior. In this zone the mangrove is replaced in the shallow water by a species of papyrus which sometimes covers large tracts. In time of flood, matted masses of it many rods square are lifted from their anchorage and carried even into the ocean, where they often surprise and mislead navigators.

It is quite beyond my power to fitly describe the forests of the interior, for here stand in a motley mixture the Scitamnaceæ, the Malvaceæ, the Orchidaceæ, Euphorbiaceæ, the Araceæ, the Bombaceæ, etc. To disentangle this confusion would require a first rate botanist. No writer can give a just description of a primitive tropical forest; it is too grand and diversified; but with all its exterior splendor and beauty, it is a deceitful and dangerous thing. Woe to the inexperienced man who essays to penetrate into its interior; he soon becomes involved in a chaos of roots, of interlacing lianas, of fallen trunks, covered with a tangled growth of thorny underbrush, all growing from a dank and swampy soil. Here he breathes a stagnant, musty, greenhouse air, which depresses the spirits and deadens the energies. Added to this there is a deep gloomy silence which broods over this place of most luxuriant growth and rapid decay. Although these mysterious shadows hide an active and varied animal life, the ear is seldom struck by a sound of any kind. Only now and then the falling of a fruit or a dry branch breaks the oppressive stillness. Early in the morning and in the short evening twilight of the tropics, some birds are heard to herald the advent or departure of the day. Such a forest is a subject of unending study, and only he whom nature has endowed with peculiar tastes and acute senses can, with use and experience, become familiar with its varied constituents, its changing phases and its silent language. Woe to the novice who without guide wanders into its recesses, where death lurks for him. In most cases he is soon hopelessly lost, and when weary and despairing he throws himself on the ground to rest, swarms of ants and other insects soon sting him into movement again. Almost no wholesome food is attainable in these forest depths, and should the traveler not die of starvation, or fall a victim to violent, acute fever, the poisonous atmosphere, slowly acting on the system, paralyzes the digestion, corrupts the blood, and produces irritating eruptions of the skin, and frequently malignant ulcers. Such is the primitive forest on the alluvial bottoms of the rivers of tropical Africa. It has been represented as a paradise, and poetical descriptions, drawn from the imagination, have inspired in many, a longing desire to penetrate their mysteries. One must, however, do as I have done, wander lost and alone for days together, enduring terrible suffering and constant fear of death before he can form for himself a true image of the real tropical primeval forest.

Among the errors current in regard to the tropical forest, is the common impression that they are full of dangers from the wild animals which inhabit them. Such dangers are, however, for the most part imaginary. Far up on the highlands of the interior, away from the rivers, the atmosphere is pure, and animal life abounds, but there the forest is, for the most part, replaced by savannahs. These, with a rolling surface covered with luxuriant grass, here and there set with picturesque groves, resemble great deer parks, in which herds of elephants, buffaloes and antelopes of many species find abundant food. In the country about the Gaboon the mammalian fauna is, on the contrary, very poor in species, but it has the crowning interest that it includes the great anthromorphous apes, *Troglodytes gorilla* and *Troglodytes niger*. Here are none of the large antelopes, giraffes, gnus, zebras, quaggas, rhinoceroses, gazelles, lions, ostriches, etc., which abound in the interior. The leopard is common, the black variety is occasionally seen, but rare. Of wild hogs there are a few bands of Phacochœrus, and in greater number, *Sus penicillatus*, the former with gigantic tusks, the other with long face, tufted ears and tail. Only a few jackals and hyenas are found, and during my six years of roaming, I have shot but one of the latter; it was the large spotted hyena. The *Mystomys velox*, which belongs to the Insectivora, is found, though rarely, along the banks and shores of rivers or lakes, hunting after crabs and fishes. From similar glands it diffuses a musky smell like that of the civet. Otters occur, also the African porcupine, and an animal resembling the great ant-eater, *Myrmecophaga jubata;* the latter is found only in South America, but a native offered to sell me at a trading post in the interior, a large and fresh skin with the long haired broom-like tail, remarkably like this species.

Beside the gorilla and chimpanzee, the monkey tribe is represented by the mandrill with the blue face, and by the long tailed dog-faced baboons, as also the black four-fingered very timid and nimble *Colobus niger*, *Cercopithecus cephus*, *C. erxlebeni*, *C. ethiops*, *C. erythropyga*, as asserted by my friend Dr. Pecknel.

In the rivers and lakes there are hippopotami which sometimes, but rarely, go down to and into the ocean. The manatee, being much hunted for its delicious flesh by the natives, who are extremely skillful in throwing the harpoon, is continually decreasing in numbers, and will probably suffer the fate of her sister of the salt water.

There are here two kinds of crocodiles, *C. tetraspes* and *C. cataphractus;* the latter resembles the East Indian Gavial in size and the form of its muzzle, while the former is more like the caiman; I have never heard that any one has here been injured by them, and yet both species, in the Camaroon near the Congo, make victims of many of the natives.

A leather-backed turtle, *Aspidonectes aspilus*, is found here, and the waters abound in fish, but they seem to me far inferior to our common European species. This may, however, be in part due to the very rude manner in which they are prepared for the table.

Of serpents there exist the following kinds: first, the slender, pointed-headed, harmless tree snakes; second, various sorts of water snakes, of which the names are unknown to me; third, we find here the largest of serpents, the python. Exaggerated reports of the size, strength and voracity of these snakes are current in the mouths of the people, and even yet in scientific books. I have frequently met with them; I even once stepped on the tail of a python eighteen feet long, which was lying stretched at full length on the ground in the torpor of digestion. To be sure it took it in bad part, but fortunately I did not give it time to fully declare its intentions, for a hasty shot of my gun laid it writhing at my feet.

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PUEBLO POTTERY.

BY EDWIN A. BARBER.

THE ancient *Pueblos* were the only aboriginal people within the limits of the United States who possessed the art of glazing their pottery. Their descendants, the Pueblo and Moqui Indians of New Mexico and Arizona, are the only tribes which manufactured a lustred ware, that remained, until a year or so ago, comparatively uninfluenced by civilization. The art may have deteriorated in some respects during the past century, yet some of the original forms of vessels have been preserved from a remote antiquity. Many of the modern productions are almost identical in shape with specimens which have been found in ancient graves and amongst the ruined buildings in the valleys of the Rio San Juan and the Rio Grande del Norte; yet the influence of Caucasian refinement has, to a certain extent, begun to show itself in the imitation of objects of recent introduction, and

we may safely conclude that aboriginal ceramic art will have disappeared forever in this section before the rapid march of civilization, within the space of a few more years. The railroad which has, during the last few months, penetrated into hitherto isolated sections of the West, inhabited by the modern Pueblo tribes, has carried away the greater portion of the native household wares, and the limited amount of pottery which is still being produced, is made in a hasty and superficial manner for sale to curiosity hunters. It will not be long ere metal utensils will supersede the fictile vessels of the natives, and specimens of earthen-ware which were made a few years ago will increase in rarity and value, which will be enhanced as the art becomes entirely obsolete.

The Tenth Annual Report of the United States Geological and Geographical Survey of the Territories, in charge of Dr. F. V. Hayden, containing several full-page lithographic plates of Pueblo pottery, has drawn considerable attention to this interesting ware. A large number of examples sent to me at various times during the past two years, however, shows more satisfactorily the great diversity of form which eminently characterizes the modern productions. Pottery is still made in the majority of the twenty Pueblo towns of New Mexico and the seven Moqui villages of Arizona. The ware produced in the different pueblos varies considerably, however, in quality and style. That made in Zuñi is probably most prolific in animal forms, whilst some of the finest workmanship is displayed in specimens fashioned at the pueblos of Acoma and Cochite. Water bottles made in imitation of birds, such as hawks and owls, are common at Zuñi, while domesticated fowls, such as ducks and hens, are favorite representations at Laguna and Jemez. Vessels shaped after models of mammals are not so numerous in any of the Pueblo villages, but there are not wanting specimens representing rams, goats, sheep, bears, cats, dogs and even a few in imitation of the human form. Indeed the Pueblo potters seem to have copied in clay every object which was familiar to them, and their pottery seems to have surpassed the ancient Peruvian *huacas* in the diversity of form. Specimens made especially for the eastern market, consist of cream pitchers, cups and saucers, miniature boats, figurines and imitations of an endless variety of objects of European manufacture, but these are comparatively worthless as examples of aboriginal art. I am indebted to the Rev. John Menaul, of Laguna, Dr. T. F. Ealy, of

Zuñi, and Dr. J. M. Shields, of Jemez, New Mexico, for a large number of characteristic and interesting specimens of modern ware from several of the Pueblo villages. Some of these examples have been in constant use as household utensils for a score of years, and represent the Indian art in its original purity. These vessels vary from three inches to two feet in diameter, the commonest form being a sphere surmounted by a short, broad cylindrical mouth. One of the finer specimens is an *olla* or meal bowl from Laguna, thirteen inches in diameter and eight in height, the body of which is ornamented with geometrical designs and conventional bird-shaped figures, while the shoulder or expanded neck is decorated with paintings of the elk or deer. This animal fig-

FIG. 1.—Water vessel from Jemez.

ures largely on much of the Pueblo pottery, and is often found on the Laguna jars. It is characterized by an exceedingly large head, thin small body and attenuated legs, with a passage extending from the mouth to the heart, which is usually triangular. The latter is generally colored red, though sometimes brown or black. A particularly interesting pot, or *teneha*, as it is called, possessing a capacity of three or four gallons, had been in use in the tribe for upwards of twenty years. Its value consists in the peculiarity of its ornamentation, being covered with paintings of serpents and conventional devices. It is difficult now to procure such pieces with representations of snakes, frogs, the sun and moon, as, according to Mr. Menaul, the priests monopolize these symbols and discourage the people from employing them. In

olden times all of the paintings on their pottery possessed some significance. *Tenehas* are made of all sizes, varying from specimens an inch in diameter to those that will hold twenty or thirty gallons. The majority of the larger vessels possess concave bottoms for steadying on the head in carrying water from the well.

FIG. 2.—Water vessel (Elk) from Laguna.

A common form is the canteen-shaped vessel, being made, in some localities, spherical, with a small bottle mouth. In the Moqui towns these are flattened on one side so as to be adapted for carrying upon the back. They are supported by woolen bands which are passed through the vertical ear-shaped handles and over the forehead of the water bearer. A large proportion of the imitative forms rep-

resent birds, and are designed for household ornaments or for carrying water on journeys. A characteristic feature in the bird vessels of Laguna is a broad, short, ascending tail with a perforation for suspension when not in use. One of these vessels, which I have in my possession, is a water bottle or duck, the only opening passing through the bill. This specimen measures six and a half inches in length, and is decorated in brown, buff and red colors on a pure white ground. Another example represents a sitting hen, the body being inflated and almost spherical, surmounted by a very small head with beak curving upward. The

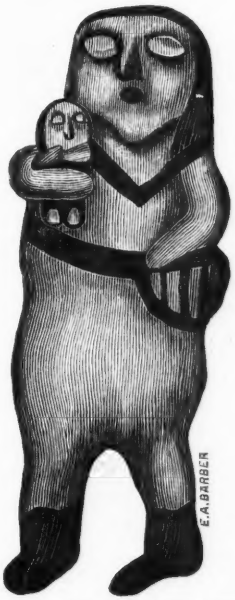

FIG. 3.—Water bottle from Laguna.

orifice is in the top of the cranium. The oldest bird-shaped vessel in the collection is represented in figure 1, and is a fine sample of Jemez workmanship. It is six inches long, the opening being in the head. From the animal forms I have selected a specimen probably intended to represent the deer. The original is twelve inches from nose to tail, with an aperture just back of the ears (figure 2). In addition to the ordinary colors the back is decorated with three triangular patches of bright green paint, which

is rare in Pueblo pottery, and has, without doubt, been recently introduced by traders. Specimens from Zia are generally of ruder workmanship, but present the same characteristics as those from the other towns. A large basin from Cochite, twenty inches in diameter, used for mixing bread in, is the finest example of Pueblo ware I have ever seen; the exterior surface is decorated with geometrical designs, while the interior is elaborately and profusely ornamented with animal figures representing elk, deer and wild turkeys, in black. The clay which composes the specimen is of a very fine, compact texture, and is covered with a luster closely resembling that seen upon many of the ancient Grecian urns.

As has been previously stated, vessels are now rarely made in imitation of the human form, and ancient pieces of this shape have never been found. Figure 3 illustrates a modern water bottle, six and a quarter inches in height, from Laguna. It represents a woman carrying an infant. Attached to her left side is a basket or bag in which her hand is thrust. The mouth of the vessel is in the back of the head. It would be tedious to extend our descriptions of modern forms. Suffice it to say that vessels have been molded into every shape that fancy could suggest or ingenuity devise. For the greater part the women are the potters, and their delicacy of touch and keen perception of beauty, enable them to produce many things which are worthy of a place with other ornaments in our cultivated homes.

The clay used in the manufacture of the Laguna pottery is of a dark-slate color, and exceedingly compact, oftentimes approaching soft rock in texture. It occurs in seams or veins in the *mesa* walls. The Indians in order to procure a good quality usually dig into the rock for some distance. There are many grades of this clay, and a variety of colors, the best sorts naturally producing the finer wares. It is prepared for use by first soaking in water for two or three days, when it becomes plastic and easily worked. It is then kneaded with the hands and all the hard lumps extracted, after which it is worked with the feet on a large flat stone, until it resembles a mass of dark colored wax. Old potsherds are also ground up and mixed with the clay in making new vessels. From this paste vessels of various forms are molded and set aside to dry.

The decoration consists of black, brown, red or buff designs

on a white or cream-colored ground. The clay used for the ground is a superior quality of kaolin. After being finely powdered, it is mixed with water and agitated, and is then poured from one vessel to another until the gritty substances are entirely removed. This coating, when of the consistency of ordinary lead paint, which it greatly resembles, is then applied to the dried clay vessels, which are in the "biscuit" state, by means of a stick, until the surfaces are entirely covered. "The lustre or glaze," remarks Mr. Menaul, "is given them when the white paint is put on, by rubbing and polishing them with a small, very smooth, flinty stone, such as you find on the sea beach. The paint, being made of a kind of pumice-stone, smooths off as if it had oil in it."

The brown or black pigment is made from a red oxide of iron, and is prepared in the same way as the white clay. Before using this in ornamenting the vessels, in order to prevent its rubbing off, it is mixed with the residue of two plants, obtained by boiling together for a long time until of the required consistency, when it is allowed to cool, and becomes perfectly hard and black. The substance formed by this combination is then applied to the white surfaces of the vessels to be decorated, by means of a brush made from a wisp cut from the surface of a corn-stalk, the designs being generally drawn without first being traced. A yellowish clay or stone which is treated in the same manner as the white, changes to a brilliant red color during the process of burning. The clay used to produce a yellow color is pink, whilst that for drab is of a grayish hue.

After the molding and decorating processes have been completed, the vessels are elevated on stones, usually in the open air, and the dried manure of goats is placed below, around and above them. This is considered the best fuel, producing a very hot, even fire of two or three hours' duration. Through the burning process the vessels are closely watched, so that no portion of them is allowed to become exposed to the atmosphere.

The Pueblo potter works very slowly, and occupies considerable time in molding and beautifying her wares. When at work she kneels upon the ground or floor of her dwelling and bending over the unfinished vessel, gradually imparts to it a symmetry of form by repeatedly going over it with moistened fingers.

The resident missionary at Zuñi, Rev. T. F. Ealy, M.D., writes

me in regard to the inhabitants of that town, "old and young try their hand at the art, making objects of all descriptions. When they wish to make anything of mud very carefully, they use the lips to wet the mud and to smooth it, and, I suppose, as a test of its quality. Of course the clay is gotten in different localities—one kind out of one *mesa*, another out of another, according as it is white, blue or red clay." The process as further described by Mr. Ealy is the same as that employed by the Laguna Indians.

Dr. J. V. Lauderdale, now stationed at Mt. Vernon, Alabama, but formerly post surgeon at Fort Wingate, informs me that "Indian women make fancy pottery as other women in civilized life make fancy needlework. They work at it in intervals of more practical labor, and they ornament it as they feel disposed to do at the time. No complete collection of their work can be made at one visit. It is necessary to make repeated visits to get a fair

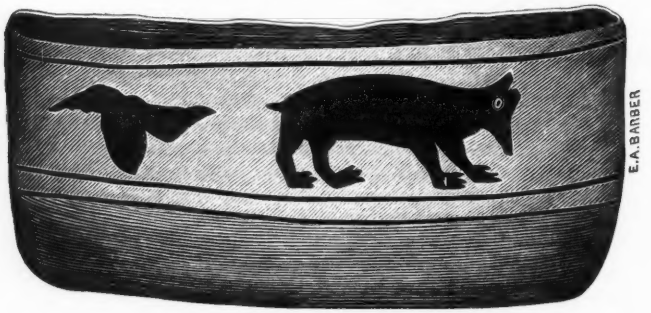

FIG. 4.—Ancient Pueblo Dish.

collection of their art in pottery. I resided near their village (Zuñi) for four years, and every time I visited the pueblo, I saw something new or a modification of what I had seen before." Mr. F. H. Cushing and Mr. James Stevenson, of the Smithsonian Institution, in 1879 collected at this place upwards of two thousand specimens of pottery, ancient and modern, of which few, if any, were duplicates.

Through the kindness of Mr. Menaul I have been so fortunate as to secure several valuable pieces of prehistoric Pueblo pottery. Figure 4 represents a rectangular dish seven and a half inches in length and four and a half in breadth, with a painting of a bear on either side. It is somewhat similar in form to the salt vessels now made by the Moqui Indians of Arizona. It was found in the ruins

of an ancient building about twenty miles north-east of Laguna. The remains are so old that none of the modern Indians know anything about them or their former occupants. Mr. Menaul informs me that in this locality the ruined houses possessed underground vaults for storehouses, which the tribes now farming the

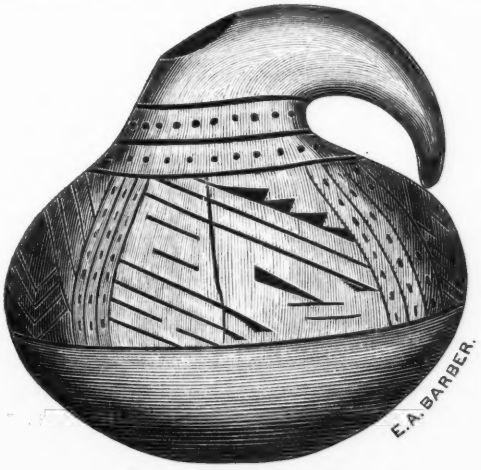

FIG. 5.—Ancient Pueblo Jar.

land do not construct. Specimens of the older pottery, possessing animal decorations, are exceedingly rare. Figure 5 is a copy of another antique vessel from the same place; it measures six inches in height, and is a perfect imitation of a gourd; the surface is very much weather-worn, and in some places the ornamentation is entirely obliterated. The small, circular orifice is situated on the upper portion of the stem or handle. Another ancient vessel from New Mexico, five inches in diameter, so old that the ornamentation can scarcely be traced, closely resembles in form a specimen from Utah in the collection of Dr. Palmer and figured in Hayden's Report for 1876, in Pl. XLV, Fig. 12. Two other specimens, from an ancient ruin in New Mexico, now known as *Pueblo Nunishe*, are of a shape similar to the modern Zuñian clay basket figured in Pl. LXIX, in the same report. These two ancient specimens are decorated both inside and out with paintings representing tadpoles, dragon-flies and turtles, the lesser divinities of water, and two animals which were probably intended to portray the squirrel (possibly skunk) and porcupine, both of which

possess the characteristic passage connecting the mouth with the heart. The older pieces described are of the same character as the ancient pottery figured by Dr. Hayden. They represent the ceramic art of past centuries, when almost the entire territory now included in Colorado, Utah, New Mexico and Arizona was thickly peopled by a semi-civilized race who were proficient in many of the useful arts and surpassed all of the other North American peoples in the art of making pottery.[1]

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RECENT LITERATURE.

UNDERWOOD'S NATIVE FERNS.[2]—In the preface to this little book of 116 pages, the author states that its design "is to furnish to those desiring a better understanding of ferns, the means of gaining a knowledge of their structure and life, and of readily determining the species growing spontaneously in North America north of the Mexican boundary." The work is divided into two parts, the first treating successively of—The haunts, habits and distribution of ferns; Morphology of the growing fern; Fructification in ferns; Germination of fern spores; Fern structure; Classification and nomenclature of ferns; How to study ferns; A little fern literature. The second part is devoted to a systematic description of all our species. The treatment of the topics taken up in the first part is good, and well calculated to prepare the learner (for in the prospectus the book is called "a manual for self instruction") for the study and determination of species. Enough is said of the growth of the prothallium, the sexual organs, the development of the young fernlet, and the tissues of the stems and leaves of the mature plant, to make many a beginner long for a compound microscope. Good directions and forms are given for the analysis and determination of any species, much as is done for flowering plants in the well known chapters in Gray's "Lessons."

The systematic part is provided with a good synopsis of the tribes and genera, and also an artificial key to genera. The arrangement is essentially the same as that in Eaton's "Ferns of North America." The disposition of the species is, within narrow limits, original, the intention evidently being to render identification of species less difficult. The inevitable glossary of technical terms (a very good one, by the way) was perhaps necessary, inasmuch as the book is largely designed for the use of amateurs and beginners, but is it not about time that the writers of books considered the advisability of explaining the meaning

[1] For article on the ancient Pueblo pottery by the author of this paper, see AMERICAN NATURALIST for August, 1876.

[2] *Our Native Ferns and how to study them, with Synoptical Descriptions of the North American species.* By LUCIEN M. UNDERWOOD.

of technical terms in the proper places in the text. Every reader or student should be expected to possess and exercise a memory of sufficient strength to enable him to keep in mind the meaning of the terms used and explained in the text. A glossary which merely re-describes or re-defines is a standing temptation to slovenly reading or study, and in the opinion of the writer, ought never to find a place in ordinary text-books designed for students.

The mechanical execution of the book, in the printing and the binding, is neat, and the typographical errors are notably rare. Professor Underwood deserves and will receive the thanks of the many fern-lovers in the country for giving us this book.—*C. E. B.*

KENT'S MANUAL OF THE INFUSORIA.[1]—This will, when completed, be the only available manual of the Infusoria in the English language, the old one by Prichard being superannuated, including as it does diatoms, desmids and Protozoa of all classes. We have looked forward with much interest to the appearance of Mr. Kent's work, and owe to the kindness of a friend an opportunity of looking over three parts which have already been published. It is a much more valuable, extensive and important work than we expected to find, and we can recommend it to microscopists and to the general student as in every way excellent, both in its scientific execution, its fullness of detail, its elaborate and comprehensive introductory portions, which will be read with much interest and profit, and the variety and excellence of its illustrations, the latter of course being an essential feature of such a work.

The first chapter gives the general history of the Infusoria from the time of their discovery, by Leuwenhoek, in 1675, to the year 1880. In the second chapter the sub-kingdom Protozoa is discussed in a way calculated to bring out clearly the relations of the Infusoria to the other classes. Mr. Kent does not regard the Gregarinidæ as entitled to constitute a distinct class of Protozoa, but rather as a "degraded group of the ordinary Rhizopoda most nearly allied to the Amoebina, which exhibit a like modification of structure with relation to the latter as is presented by the Opalinidæ with respect to the ordinary Ciliata." He divides the Protozoa, somewhat unnecessarily we think, according to the degree of differentiation of the ingestive area or mouth, into four sections, naming them as follows: *Pantostomata* (Rhizopoda and a part of the Flagellata); *Discostomata* (the sponges), *Eustomata* (the higher Flagellata and the Ciliata), and (4) the *Polystomata* (including the Tentaculifera alone). We think this sub-division is unnecessary and the nomenclature superfluous, though well calcu-

[1] *A Manual of the Infusoria:* including a description of all known Flagellate, Ciliate, and Tentaculiferous Protozoa, British and foreign, and an account of the Organization and Affinities of the Sponges. By W. SAVILLE KENT, F. L. S., etc. London, David Bogue, 1880. Parts I to III, each 10s. 6d. 8°.

lated to call attention to the successive steps in the differentiation in the Protozoa of a "mouth" or ingestive area.

The author's system does not recognize the *Monera* of Haeckel, and he rather dogmatically relegates them to the Rhizopods, not awaiting further discoveries as to the presence or absence of a nucleus, dismissing them with the remark that since the Foraminifera, included by Haeckel in the group Monera, have been proved to possess a nucleus, "A similar demonstration of the possession of nucleolar structures in the few remaining organisms relegated to this group will not improbably result from their further careful examination, with the assistance of the special treatment resorted to in the case of the Foraminifera. Finally, it is altogether questionable whether the presence or absence of a nucleus or endoplast can be accepted as furnishing a distinct and reliable character even for specific diagnosis. This structure, as shown at greater length in the chapter devoted to the organization of the Infusoria, is evidently in many instances an accompaniment only of the matured and reproductive phase."

Mr. Kent also, and here we think with excellent reason, dismisses as "entirely unnecessary and untenable," the *Protista*, a kingdom set up by Haeckel and including all organisms supposed to be intermediate between the plants and animals and comprising the lowest representatives of both; although our author is clearly alive to "the difficulty of indicating a clear line of demarkation that shall arbitrarily separate certain unicellular cryptogamic plants or Protophyta from the unicellular animals or Protozoa." Mr. Kent claims, however, as the result of close investigation on his part upon Volvox and Protococcus and certain allies of these forms, that he failed to find any periodically contracting vesicles, and he thinks that the absence of a contractile vesicle is characteristic of these lowest plants.

Our author regards the Myxomycetes or *Mycetozoa* as belonging to the animal kingdom, remarking that "the evidence most recently and independently eliminated by L. Cienkowski and Dr. A. de Bary, concerning the structure and life-history of this most remarkable group, establishes, however, beyond question their purely animal nature. The Mycetozoa, in common with all ordinary representatives of the Protozoa, originate from minute sporaloid bodies which escape from the spore case as monadiform animalcules having a soft, plastic body-substance, a single terminal flagellum, contractile vesicle and endoplast or nucleus, being thus in no way distinguishable from the typical representatives of the ordinary Flagellata-Pantostomata, as met with in the genus Monas." He then farther recapitulates their later developmental stages, and gives good reasons for their Protozoan nature.

Another singular and doubtful group, the Labyrinthulida, are likewise referred by Mr. Kent, to a position in the Protozoa midway between the Foraminifera and the Myxomycetes. The sponges

are by Mr. Kent regarded as forming simply a single order (Spongida) of Flagellate Infusoria and standing next to his order of Choano-Flagellata, represented by the stalked, collared Codosiga, Salpingœca, and Protospongia.

The structure of the Infusoria proper, are then described with much clearness and detail, as well as their reproductive phenomena, the author devoting considerable space to the modern view of Balbiani and the opposing one of Engelmann and Bütschli as to the nature of reproduction in the Infusoria. While not accepting Balbiani's views, afterwards confirmed by Kölliker, Stein, Claparède and Lachmann, that the nucleus is an ovary and the nucleolus is a testis, and that certain Infusoria reproduce by eggs fertilized by seminal particles analogous to those of the higher animals, the author insists that germs or embryos are in several forms produced by the subdivision of the nucleus. He also maintains that the process of conjugation, especially in the Vorticellidæ, where it is complete and permanent, and so far as is known in all the Flagellata, the larger individual corresponds to the female element, or egg, and the smaller to the male element, or spermatozoön.

Sections follow on the affinities of the Infusoria to the higher animals, their distribution, the modes of preserving them for study, the methods of investigation, while the fourth chapter is devoted to a discussion of the doctrine of spontaneous generation.

The succeeding chapter on the nature and affinities of the sponges comprises a long discussion of the question as to the position of the sponges in the animal kingdom, with the result of considering them as an order of Flagellata Infusoria, allied to Codosiga, etc., a view first proposed by Professor H. James Clark, of this country. The historical treatment of the subject is just to other observers and moderate and original in the views presented. Mr. Kent believes with Clark that the sponges are colonies of collared flagellate infusoria, and considers that the Protospongia is the connecting link between the genuine Flagellata with a collar and the sponges. He considers that the fact that the collared cells lining the ampullaceous sacs of the sponge have a contractile vesicle like genuine Infusoria, is a powerful argument in favor of their Flagellate affinities. The strongest argument against the Protozoan nature of sponges, is the fact that they are now generally recognized to develop from true eggs, which are fertilized by genuine spermatozoa, and that the eggs undergo segmentation, passing through a condition at least analogous, if not homologous with the morula and gastrula, or at least planula of the Cœlenterates. We have not space to give the author's arguments, even in a condensed form, and would only state that they are well put and cogent, while at the same time, throwing out Haeckel's work, whose merits Mr. Kent is disposed we think to somewhat underrate, and confining ourselves to the result of the elaborate and careful observations of Melschnikoff, F. E. Schultze and

Barrois, we fail to be convinced that the sponge is not a many-celled animal, reproducing by eggs and passing through stages comparable with the mulberry and planula stages of the jelly fishes. If the reader, after studying the works of the above named authors, will then read the admirable summary of the embryology of sponges in Balfour's Comparative Embryology, we think that he will be inclined neither to accept the view that the sponges are on the one hand genuine Protozoa, nor on the other genuine Metazoa. In this connection the suggestions of Balfour as to the Protozoan affinities of the sponges will have much weight. The arguments of Mr. Kent have made a strong impression on us, and have led us, while believing that the sponges represent a distinct subkingdom, to look with more favor than heretofore on the close relations of the sponges to the Protozoa. Indeed, we should feel strongly inclined to the view that the sponges belonged to a category or super-branch, as we might consider it, intermediate between the *Protozoa* and *Metazoa*, to which the term *Spongozoa*, already used, might well be applied. We do not see why the so-called eggs of sponges are not such, even if they are originally amœba-like forms, that of Hydra being at one time amœbiform. Kent has studied more closely than any one else the so-called spermatozoa of the sponges, and concludes that they simply correspond to the spores which originate from the collared Flagellata, but we should hazard the opinion that his facts may be interpreted in an opposite way, and judging from his drawings do not see why his cells (see Pl. x, fig. 11, b on upper edge of figure) containing spores do not correspond to the mother-cells inclosing the incipient spermatozoa of higher forms of Metazoa. The lining cells of the ampullaceous sacs, even if they are collared, appear to us to fairly represent the epithelial tissue of hydra and higher animals, though forming a less homogeneous, differentiated tissue; why should not, as in Metazoa, certain of the epithelial cells become specialized in the manner described by Kent, and form egg-cells and sperm-cells? The striking individuality of the sponge-cells and their power of ingesting living algæ and other minute organisms have lately been shown to exist by different observers in different Cœlenterates. We owe to Messrs. James Clark and Saville Kent, we are bound to say, strong arguments for the Protozoan affinities of the sponges, but when we balance their observations and conclusions with those of Haeckel, Metschnikoff, Schultze and Barrois, we cannot resist the impression that the sponges should stand as an independent branch half way between the Protozoa and Cœlenterates or Metazoa in general. They are the connecting links between the unicellular and the many-celled animals; between those without tissues and germ-layers, and those with genuine tissues and definite cell-layers. We may fail to apply the terms ectoderm, mesoderm and endoderm to the but partially differentiated tissues

of the sponges, we may deny them a true morula and gastrula condition, but still they will be found to wonderfully anticipate the Metazoa in these respects, and will thus serve as transition forms, connecting at many points the Protozoa and Metazoa, and showing that the distinction involved by these terms is more or less artificial. By a study of the sponges we can see how it has been possible for tissues and germ layers to have had an origin. In short, to regard the sponge as Protozoa, seems to us as extreme as to consider them as forming a division of Cœlenterates.

The systematic part of Mr. Kent's work is well done, the generic and specific characters are given in much detail. The work is evidently the result of much labor and skill, in microscopic observation and delineation, and will, we feel sure, incite many others to study these infinitesimal forms.

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GENERAL NOTES.

BOTANY.[1]

A BOTANIST'S TRIP TO "THE AROOSTOOK."—I find by reading the NATURALIST, that all matters of botanical interest are welcomed by its editors, and full of the enthusiasm of all lovers of nature, I venture to send to its readers a brief account of my life last summer in Aroostook county, Maine. I went there for the purpose of gathering "wild flowers," hoping to add a few new species to the large number which I had already collected in various counties in the State. I arrived at Fort Fairfield July 6th, and to my delight found the banks of the Aroostook river abounding in work for my brush. I remained there six weeks, and enriched my portfolio with sketches of the following plants, viz: *Tofieldia glutinosa*, *Allium Schœnoprasum*, *Parnassia Caroliniana*, *Triglochin palustre*, *Castilleia pallida*, *Rosa blanda*, *Anemone Pennsylvanica*, *Campanula rotundifolia* var. *linifolia*, *Ascyrum stans*, *Tanacetum Huronense*, *Hedysarum boreale* and *Astragalus alpinus*. (The three latter are reported by Professor Goodale and Mr. C. G. Pringle.) From Fort Fairfield I went to Caribou and Presque Isle, still following the river. In these places I gathered *Oxytropis campestris* (also reported by G. L. G.), *Nabalus racemosus*, *Lobelia Kalmii*, *Polygala Senega*, besides many more plants with which the banks abound. And in a cold deep swamp at Caribou, which they call the "Bog on the Barren," I gathered large quantities of *Valeriana sylvatica*, *Galium trifidum* vars. *pusillum* and *tinctorium*, *Epilobium molle*, and a few specimens of *Microstylis monophyllos* and *M. ophioglossoides*. Orchids abound in these wet, inaccessible places, especially *Cypripedium spectabile*, *Habenaria dilatata* and *H. hyperborea*. I found the first named in such masses and so high that it hindered our progress considerably. In an equally cold bog at Presque Isle, I gathered *Ribes rubrum*, *Lonicera oblongifolia* and *Rhamnus alnifolius*. In "a fallow" at Caribou, occurred an abnormal form of *Viola canina* (Aug.); I gathered it because it was so late in the season and the blossoms were so pretty, not discovering at the time that they were spurless, but I have shown them to four botanists and they agree that they are *V. canina*, and are both spurless and beardless. In the same wild and fascinating place I found large numbers of the delicate fern named *Cystopteris bulbifera;* it was so woven into the underbrush that the longest specimens which I was able to procure in a perfect state are but two feet in length, but they grew much longer. It was warm and

[1] Edited by PROF. C. E. BESSEY, Ames, Iowa.

damp there, and nestled beneath them were plants of *Asarum Canadense.* The same morning I stood to my eyes (five feet) in masses of *Eupatorium ageratoides.* It is a coarse but very showy plant with large corymbs of white flowers. It is abundant in Northern Maine. I mention the height of this plant to give some idea of the rank growth of the "weeds" in this county, and I will state here that I saw *Verbascum Thapsus* ten feet high, also *Lactuca Canadensis.* Go and see! I will not tell my aster story here, but will wait till we visit the place where I found it. *Sedum Telephium* is a very troublesome weed in some parts of the county, whole acres of land being overrun with it, and I am told that it has been there as long as the oldest inhabitants can remember. The only new plant which I found in the Swedish colony was *Ribes lacustre.* In riding from Caribou to Van Buren, a distance of twenty-two miles, the monotony of the wearisome ride was relieved by clumps of *Chenopodium capitatum.* Burdened with its bright red, pulpy fruit, it had sprung up among the charred stumps like a thing of beauty, as it was. At Van Buren we struck the St. John river, but the same plants which I have enumerated above repeated themselves with a few additional ones. Pedicularis, n. sp.? grew three feet high on the bank of the river where the water trickled down its sides. Among other plants I gathered *Galeopsis ladanum* and *Solidago virga-aurea, S. thyrsoidea,* and *S. bicolor* var. *concolor.* I did not see the typical form in this latitude, which by no means proves that it is not found there. *Solidago squarrosa* is abundant everywhere, and grows so rank that its only beauty lies in its gay color. Now for my large story. I measured *Aster puniceus* six feet and a-half high (Gray allows six feet), and the stem seven-eighths of an inch in diameter; it stood in a deep, narrow, damp ravine, and many of the branches were three feet long. It looked like a huge bouquet of purple flowers. The ferns which attracted my attention particularly at this place, were *Botrychium Virginianum* and *B. lunarioides,* vars. *dissectum* and *obliquum, Adiantum pedatum* and *Struthiopteris Germanica. Halenia deflexa* abounds throughout the county. *Viburnum opulus* was so abundant with its scarlet berries, that it made the landscape gorgeous. In the ride of forty-five miles along the river to Fort Kent, we found nothing new. At Frenchville, where the St. John turns to the south (the highest latitude to be reached in Maine), we looked upon acres of the mammoth stalks of *Solidago squarrosa.* In the two and a-half months which I passed in the county, I noted 208 different plants, and added fifty new ones to my own list. I saw a man in the county who cursed our "high sounding names." Ambitious to possess foreign shade trees, he was indignant to find that *Pirus Americana* and *Ulmus Americana* mean simply "round wood" and "elm," with which his forests abound. It may be worthy of notice that I found *Gaylussacia dumosa* fifty miles from the sea coast.—*K. Furbish.*

OUR SPECIES OF CEDAR APPLES.—The curious growths on white cedar, red cedar and juniper, to which the name Cedar Apples has been given, have recently been carefully studied by Dr. Farlow. The results of his studies are published in the Memoirs of the Boston Society of Natural History, covering thirty-eight quarto pages, and accompanied by two plates.[1] This important contribution is the first of a series of papers upon the Uredineæ, which Dr. Farlow hopes to publish soon. The popular interest in these plants is sufficient reason for giving space here for a synopsis of the paper.

All the cedar apples are now considered to be species of the genus Gymnosporangium, belonging to the order Uredineæ, and nearly related to the rusts (Puccinia, Uromyces, Phragmidium, etc.), from which they differ mainly by having their teleutospores imbedded in a mass of jelly. The life history of all our species is involved in some obscurity, which the careful and prolonged observations and experiments of the learned author have not been able to dispel. Œrsted, De Bary and others have succeeded in showing that the European species of Gymnosporangium have the same relation to certain species of the old genus Rœstelia, as subsists between the teleutosporic stage (Puccinia) of the grain rust, and the cluster cup of the barberry (Æcidium). In other words, it has been shown that certain supposed species of Rœstelia are but the æcidia of certain species of Gymnosporangium. Now as we have several species of Rœstelia in the United States, it may be supposed that a similar relation exists between them and certain of our Gymnosporangia. The most careful experiments have failed to show any such connection, however.

Most cedar apples are perennial, and appear year after year upon the host. The teleutospores, which are mostly two-celled, sometimes several celled, develop in little clusters which expand into columnar or irregular masses (technically called the *sporiferous masses)* when wet, as after a rain. In this expanded state they are very conspicuous, and are often mistaken by the non-scientific for the flowers or the fruits of the trees upon which they grow.

The following generic and specific descriptions are taken without modification from Dr. Farlow's paper; in his paper, however, each description is accompanied with notes upon their synonomy, and copious discussions upon structural peculiarities.

Gymnosporangium De Cand.

Spores yellow or orange-colored, usually two-celled, occasionally one to six-celled, on long hyaline pedicels, imbedded in a mass of jelly which, when moistened, swells into columnar or irregularly expanded masses. Mycelium parasitic in the leaves and branches of different Cupressineæ, producing in them various distortions.

[1] The Gymnosporangia, or Cedar Apples of the United States. By W. G. Farlow.

The genus as here defined includes the species of the old genus Podisoma.

1. *G. Ellisii* Farlow.—Sporiferous masses numerous, scattered, cylindrical, filiform, from one-eighth to a quarter of an inch high; spores dark yellow, linear-fusiform, obtuse, usually three to four-celled, sometimes one to five-celled, 10 to 16 μ. in diameter, 75 to 190 μ. long, average 120 to 150 μ.; pedicels long and slender; promycelia short and much curved, usually one from each cell. Mycelium perennial, distorting the smaller branches. On *Cupressus thyoides.* N. J., Mass.

2. *G. clavariæforme* De Cand.—Sporiferous masses numerous, scattered or aggregated, yellowish-brown when dry, bright yellow when swollen, cylindrical or slightly compressed, acute or occasionally forked at the apex, from a quarter to half an inch high; spores narrowly lanceolate, those on the outside of the gelatinous masses clavate, two-celled, 13 to 19 μ. broad, by 55 to 90 μ. long; promycelia usually one or two from each cell. Mycelium perennial, causing long fusiform swellings of the branches. On *Juniperus communis.* Maine.

3. *G. macropus* Lk.—Sporiferous masses aggregated in globose tufts, surrounded at the base by a ring formed by the raised epidermis and subepidermal tissue of the host plant, orange-yellow, cylindrical, acuminate, half an inch to an inch long, or at times longer; spores ovate-acute, two-celled, generally constricted at the septum, and with a papilla at the apex, 15 to 20 μ. broad, by 45 to 60 μ. long; promycelia generally four from each cell. Mycelium annual, producing globose or reniform knots in the smaller branches. On *Juniperus Virginiana.* Mass. to S. C. and westward to Wis., Mo. and Colorado.

4. *G. fuscum* De Cand.—Sporiferous masses numerous, generally approximated brownish when dry, dark-orange when swollen, a quarter to half an inch high, compressed-conical or wedge-shaped, upper margin thick, rounded, sometimes notched; spores roundish-ovate, two-celled, frequently constricted at the septum, 38 to 53 μ. long, by 15 to 22 μ. broad; upper cell either nearly hemispherical or obtuse; promycelia generally four from each cell. Mycelium perennial, causing long swellings of the branches. On *Juniperus Virginiana* and *J. communis.* Mass., Md.

5. *G. fuscum* De Cand., var. *globosum* Farlow.—Sporiferous masses densely aggregated, dark-brown when dry, yellowish-orange when swollen, a quarter to half an inch high, compressed-conical or wedge-shaped; spores ovate, sub-acute, 38 to 45 μ. long, by 19 to 21 μ. broad; promycelia usually four. Mycelium perennial, forming globose swellings in the branches. On *Juniperus Virginiana.* Mass. to S. C.

6. *G. biseptatum* Ellis. — Sporiferous masses flattened and brownish when dry, becoming hemispherical or oval and rugose when swollen, and of a light-yellow color, about a quarter of an

inch high; spores linear-oblong, obtuse, two to six-celled, most frequently three or four-celled, 50 to 84 μ. long, by 15 to 20 μ. broad; promycelia one or two from each cell. Mycelium perennial, forming node-like swellings in the branches. On *Cupressus thyoides.* Mass., N. J. On Libocedrus, Calif.

7. *G. clavipes* C. and P.—Sporiferous masses subpyriform or irregularly globose, becoming indefinitely expanded, reddish-yellow when dry, orange when swollen, about a quarter of an inch high; spores broadly ovate, obtuse, two-celled, generally constricted at the septum; pedicels broad, much swollen beneath the spores, 40 to 60 μ. long, by 22 to 38 μ. broad; promycelia usually two or three from a cell, frequently produced from the apex of the cells. Mycelium perennial in the leaves and branches, producing nest-like distortions. On *Juniperus Virginiana.* Mass., N. Y., N. J., Penn., N. C., S. C.

8. *G. conicum* De Cand.—Sporiferous masses subpyriform or indefinitely expanded, orange colored, half an inch high; spores oblong, two-celled, constricted at the septum, 48 to 58 μ. long, by 15 to 18 μ. broad; promycelia either two or four from each cell, given off near the septum. Mycelium perennial, forming long swellings in the branches. On *Juniperus Virginiana.* Mass., N. Y., S. C.

COHN'S CLASSIFICATION OF THE THALLOPHYTES.—This recent attempt at a satisfactory disposition of the Thallophytes deserves the careful study of botanists. As will be seen, Cohn still holds to the view originally put forth by him in 1872, which discards the old groups Algæ, Fungi and Lichenes. The present arrangement differs from his former attempt in several particulars, the most important of which is the disposition of the orders in two diverging series, the Carposporeæ and Gamosporeæ. Several things strike one as out of place. It is difficult to see, for example, any sufficient reason for placing the Schizosporeæ in the series Carposporeæ. The position of the Myxomycetes is also a curious one; it is only in a purely fanciful way that the plasmodium of the Myxomycetes can be regarded as a colony *(cœnobium)* similar to that of Volvox, Hydrodictyon, etc. The position assigned to the Ustilaginaceæ near Mucoraceæ is, to say the least, questionable. The Entomophthoræ are much more nearly related to the Saprolegniæ (if indeed they are not to be classed with them) than to Piptocephalis and Mucor.

SERIES I.—CARPOSPOREÆ.

This is nearly identical with the group of the same name as defined by Sachs in the fourth edition of his "Lehrbuch." It however includes the Schizosporeæ, and excludes the Characeæ, which are considered as low forms of Bryophyta.

ORDER 1. SCHIZOSPOREÆ: (*a*) *Schizophyta.* Families, Chroococcaceæ, Oscillariaceæ, Scytonemaceæ, Nostocaceæ, Rivulariaceæ. (*b*) *Schizomycetes.* Fam. Micrococcaceæ, Bacillaceæ, Cladotrichaceæ, Myconostaceæ.

ORDER 2. TETRADOSPOREÆ (Florideæ): Fam. Bangiaceæ, Dictyotaceæ, Nemaliaceæ, Lemaneaceæ, Ceramiaceæ, Gigartinaceæ, Sphærococcaceæ, Rhodomelaceæ.

ORDER 3. ASCOSPOREÆ: (*a*) *Gymnocarpi*, Saccharomyces, Ascomyces, Exoascus, Gymnoascus. (*b*) *Æcidiocarpi*, Fam. Uredineæ, Calyciaceæ. (*c*) *Discocarpi*, Fam. Stictideæ, Graphideæ, Hysteriaceæ, Bulgariaceæ, Lecideaceæ, Pezizaceæ, Collemaceæ, Parmeliaceæ, Usneaceæ. (*d*) *Porocarpi*, Fam. Laboulbeniaceæ, Sphæriaceæ, Lichenaeæ, Verrucariaceæ, Pertusariaceæ. (*e*) *Cleistocarpi*, Fam. Erysiphaceæ, Eurotiaceæ, Tuberaceæ.

ORDER 4. BASIDIOSPOREÆ: Fam. Auriculariaceæ, Tremellaceæ, Telephoraceæ, Clavariaceæ, Polyporaceæ, Agaricaceæ, Phallaceæ, Hymenogastraceæ, Lycoperdaceæ, Nidulariaceæ.

SERIES II.—GAMOSPOREÆ.

The single reproductive cells, formed by the sexual union of other cells, provide the main character binding together the groups of plants constituting this series.

ORDER 1. CONJUGATÆ: (*a*) *Zygophyceæ*, Fam. Bacillariaceæ, Desmidiaceæ, Zygnemaceæ. (*b*) *Zygomycetes*, Fam. Entomophthoraceæ, Ustilaginaceæ, Piptocephalideæ, Mucoraceæ.

ORDER 2. SIPHOIDEA: (*a*) *Siphophyceæ*, Fam. Caulerpaceæ, Bryopsideæ, Codiaceæ, Vaucheriaceæ. (*b*) *Siphomycetes*, Fam. Peronosporaceæ, Saprolegniaceæ, Chytridiaceæ.

ORDER 3. CŒNOBIÆ: (*a*) *Cœnophyceæ*, Fam. Protococcaceæ, Palmellaceæ, Valoniaceæ, Volvocaceæ, Hydrodictyaceæ. (*b*) *Cœnomycetes*, Fam. Myxomycetes.

ORDER 4. CONFERVOIDEÆ: (*a*) *Syngametæ*, Fam. Ulvaceæ, Ulotrichaceæ, Cladophoraceæ. (*b*) *Oosporeæ*, Fam. Sphæropleaceæ, Oedogoniaceæ, Coleochætaceæ.

ORDER 5. FUCOIDEÆ: (*a*) *Phæosporeæ*, Fam. Ectocarpeæ, Sphacelariaceæ, Chordariaceæ, Laminariaceæ, Sporochnoideæ. (*b*) *Oosporeæ*, Fam. Fucaceæ.

BOTANICAL NOTES.—The Secretary of the Linnean Society, B. D. Jackson, has recently been directing attention, in the *Journal of Botany*, to some recent tendencies in botanical nomenclature, and among others he deprecates the tendency, in some quarters, to the abandonment of the rather liberal use of initial capital letters in writing specific names, which Linnæus introduced. He regards the usage of Linnæus as authoritative, and cites examples to show that the initial capital letter should be used when the specific name is (1) an old generic name, (2) a native name, (3) a substantive used instead of an adjective, (4) a substantive used in the genitive case, (5) a substantive used adjectively in commemoration. "All other names," he says, "must begin with a small letter, even if derived from places or other genera." This certainly commends itself as conducive to *uniformity*, but were it not that at most it is a matter of but little importance, it might be asked whether even so great a master as Linnæus should be permitted to fix usage for all time.——In the same journal S. L. Moore dissents from Darwin's doctrine of the nature and meaning of cleistogamy, and believes "that cleistogamy is caused by the physiological condition of great fertility without crossing, coexisting with the morphological one of germination of the pollen while still within the anther-cell, or at least before expansion of the perianth. The result of the latter condition is arrest of the floral envelopes, which remain in position until separated or pushed up by the enlarging capsule." He bases this theory upon the well known fact that after fertilization the corolla soon withers. ——There is a widespread notion that it requires costly micro-

scopes and a good deal of apparatus to enable one to successfully engage in histological study in botany. The fallacy of this notion is well shown in an article in the April *Botanical Gazette*, by Dr. Rothrock, who describes the apparatus and modes of work in De Bary's laboratory in Strasburg. Hartnack's small upright microscope, without sub-stage or joint, and costing from thirty to forty dollars, are used. The optical parts are, however, of good quality, and furnish a power ranging up to about six hundred diameters. In making sections, razors and pieces of pith are mainly relied upon, expensive section cutters not being used.——Dulau & Co., of London, are to publish immediately an important book, "A Guide to the Literature of Botany," by B. D. Jackson. It includes nearly six thousand more titles than Pritzel's "Thesaurus."——"A Manual for the Preservation of the larger Fungi," by James L. English, is announced as in preparation.——M. C. Cooke has begun the publication of Illustrations of British Fungi, consisting of colored plates of the Hymenomycetes. The parts, issued quarterly, include sixteen octavo plates each.——Professor McBride, of the University of Iowa, has issued a Plant Record for the use of Students, which in some respects is an improvement upon any previously published ones.——J. F. James, in the *Journal of the Cincinnati Society of Natural History*, presents a paper in which he compares the flora of N. E. United States with that of Europe. It is an excellent summary of what is known as to the geographical distribution of plants.——Dr. Gray and Dr. Hooker have finally brought out their long promised report upon the vegetation of the Rocky Mountain region. It is published in Vol. VI of the Bulletins of the U. S. Geol. and Geog. Survey of the Territories. It will be noticed more fully hereafter.——Francis Wolle contributes another of his valuable notes on Fresh-water Algæ, to the April *Torrey Bulletin*.——An interesting list of the plants of Western Dakota and Eastern Montana, by Assistant Surgeon Havard, has just been issued from the Government printing office, as an appendix to the Report of the Chief of Engineers for 1880.

ZOÖLOGY.

MORE ABOUT THAT CAT.—In the February NATURALIST, I narrated some instances of unusual sagacity in our pet cat, "Old Shorty." He died on the 19th of that month, deeply lamented by his friends. He was not only a model of all the virtues consistent with the feline life, but possessed many high and noble traits not supposed to appertain to this species of carnivores. I mentioned his fastidiously neat and tidy habits, which he maintained down to the last day of his life. We once had a pet squirrel which was kept in a cage with the usual revolving wheel. "Shorty" never molested the mischievous rodent unless he happened to escape from the cage, when he was always ready to help

capture the scamp. I have often pursued "Chip" fifteen or twenty rods with "Shorty" close at hand and lending me every assistance in his power! On one occasion when the family were all away from the house, "Chip" got out of the cage and escaped through an open window. Returning late in the afternoon, I found him in a plum tree. "Shorty" sat on the ground near by, he had evidently run the squirrel up the tree, and was patiently standing guard—like a master of grand strategy—"waiting for reinforcements." Together we captured the squirrel and returned him to his cage. When "Shorty" was about three years old, we gave him away to a lady friend, who carried him to her house in the county, three miles off, by a very crooked road and after dark. She kept him shut up for three or four days, when he was released. He started at once for home, though he was fully three days in reaching us. We imagined that the sounds of the church and schoolhouse bells in the village enabled him to find his way back. He had to cross a small stream, which would be quite a serious obstacle in the way of a cat, and this, doubtless, made his journey more protracted. But we never gave him away again! He had no fear of any dog he ever met, and in his younger days had the honor of soundly threshing several of them! I could set him upon any stray dog that happened to come upon the premises. He never failed to drive the intruder off, and woe to the dog if he failed to "git out" in a twinkling! Contrary to the prevailing disposition of common cats, he never stole anything! Neither choice beef nor Jersey milk on the pantry shelves ever tempted him to violate the eighth commandment. He was sick at the last about three weeks, as we supposed from some derangement of the liver, though he was fifteen years old. He dearly liked to be talked to all this time, and in return would always purr, though but faintly and with much effort. He sang his last little song to me about ten hours before he died, as I sat holding his poor weary head in my left hand and stroking his rich glossy back. I was telling him how good he had been all his life long, and how sorry I was to see him so sick. But his little song was so faint and low that I had to put my ear close to his mouth to hear it. He was gentle, affectionate and intelligent beyond any domestic animal I ever saw, and his whole life was full of beautiful, pleasant ways. When he finally breathed his last, the old house seemed really deserted and lonesome—though he was "only a cat." We always thought he would deserve a monument, and we feel that in admitting his humble story to its pages, the AMERICAN NATURALIST has given him a proud and enduring one.—*Chas. Aldrich, Webster City, Iowa, March. 1881.*

BIRDS OUT OF PLACE.—The red-wing blackbird *(Agelains phœniceus)* usually leaves this region by the middle of November, though if the weather continues mild, some of them will tarry

awhile longer. But late in December I saw perhaps a dozen of them wading in the shallow water just below a mill-dam near my residence. They remained about this place for several days. At the time the ground was covered with snow, and the ice was more than fifteen inches thick on the mill-pond above.

Lately a workman on my farm stated that in January he had seen a robin *(Turdus migratorius)* where a little spring of water flows out of the bank below the mill-dam. This was deemed a mistake, for the robin always leaves us in autumn and never returns until mild weather in late February or early March. But chancing to pass the same spot yesterday, my attention was attracted by a bird which was hopping over the gravel bed and stopping to pick up something. Going as near as I could without alarming it, I saw at once that it was our own robin redbreast! It seems more singular that it should remain with us when its mates are all away in the sunny South! To-day we are having a regular Iowa "blizzard." The snow would be twenty inches deep if it were not piled in great drifts, and the ice in our little river is at least three and a half feet thick! I visited the spot to-day, but did not find my robin. Several chickadees *(Parus atricapillus)* were hopping about the spring, doubtless in search of food or drink.

One of my neighbors provides his fowls with no sort of protection in the way of a building, and so they roost in the low branches of a thicket near his house. Recently, during a severe storm, he found several crows roosting among the chickens. Upon being discovered, the crows flew off, cawing angrily over their disgust at being disturbed. Our crows are never shot or molested in any way, and have, therefore, become quite tame; but I never before heard of their entering into sleeping arrangements with barnyard fowls! But during such cold nights as we have had this winter—often from ten to twenty-nine degrees below zero—I do not wonder that birds flock together for mutual warmth "regardless of race, color or previous condition of servitude."—*Chas. Aldrich, Webster City, Iowa, Feb. 12, 1881.*

A Hawk New to the United States.—It affords me great pleasure to be able to announce, through your columns, the addition to the United States fauna, of a species of hawk hitherto not recorded from any point north of Mirador, Mexico, The question of what name the species should bear is one involving considerable investigation, pending which I will call it, provisionally, *Buteo fuliginosus* Sclater. It is a small species about the size of *B. pennsylvanicus*, but with longer wings and of a uniform black color, like *B. abbreviatus*. It has been considered by various ornithologists to be a darker or melanistic phase of *B. brachyurus*, but in this view I cannot concur, no specimens among the many I have examined, indicating that any light color phase exists; both young and old, though otherwise quite different, being uni-

form black below as well as above. While premising that this bird *may* be the *Buteo fuliginosus* of Sclater, it should be remarked that in "History of North American Birds" (Vol. III, p. 266), I referred to *B. swainsoni* on the presumption that it was probably based on a small example of the latter species in the dark phase of plumage; but I may have been wrong in this determination.

The specimen in question was shot at Oyster bay, Florida, Jan. 28, 1881, by W. S. Cransford, and was secured for the National Museum from W. H. Collins, of Detroit, Mich.—*Robert Ridgway in Forest and Stream.*

Curious instance in the Breeding Habits of the Bluebird.—In April, 1879, while on a collecting tour near Prince Frederictown, Maryland, I found a nest of the blue-bird *(Sialia sialis)* in a hollow post. The eggs, five in number, were remarkably small, and in the body of the nest were three other specimens, abnormal in shape and very large. As this is the only instance of the kind I have ever heard of, it may not be amiss to record it. Either the original owners had been driven away by a new pair, who having rebuilt the nest, laid their own eggs; or the first three were deserted. The latter explanation is sustained by the small size of the five found in the upper part. Curiously enough both sets were perfectly fresh.—*A. M. Reynolds, Germantown, Pa.*

Zoological Notes.—The parasites of the white ant *(Termes flavipes)* have been described and illustrated in an elaborate way by Professor Leidy, in a memoir recently published in the Journal of the Academy of Natural Sciences of Philadelphia. They are profusely abundant in the intestine of the insect, and mostly consist of ciliated infusoria, which swarm in such myriads as to actually predominate over the real food in quantity. Besides a young nematoid worm and a gregarine, there are three or four infusoria, a vibrio, and a minute filamentous alga, which was previously known to inhabit the digestive canal of certain myriapods and a beetle *(Passalus cornutus).*——In the thirteenth number of Vol. VIII of the Bulletin of the Museum of Comparative Zoology, Mr. Walter Faxon describes and figures certain deformities in the lobster, most of which appear to originate from injuries received after molting, before the new skin becomes hardened by the deposition of salts of lime. Mr. Faxon, after reviewing all the deformities which have been described among Arthropods, divides them into five categories: *(a)* of deficiency in nutrition, *(b)* of excess, *(c)* of transformation, *(d)* of arrested development, and *(e)* of hermaphroditism.——In an article on the mode of formation of the blastoderm in the Araneida, by A. Sabatier, translated in the *Annals and Magazine of Natural History* for March, it appears that the early development in the egg of the

spider presents an intermediate type between eggs with general superficial segmentation of the Crustacea, such as Peneus, and the eggs with regular discoidal segmentation, such as those of certain fishes, that is to say, it has a blastulation intermediate between periblastulation and discoblastulation. It greatly approaches the eggs of Chelifer (Metschnikoff), Tetranychus (Claparède), and of insects (Bobretsky). Thus is plainly manifested from the outset the affinity of the Araneina with the groups of Arachnida and with the insects.——The Bezoar or guliga stones are concretions or calculi formed in the "stomach and intestines" of the red monkey, a species of Semnopithecus abundant in the interior districts of Borneo. Mr. A. H. Everett says (in the *Ann. and Mag. Nat. Hist.*, March) that "accounts vary very much among the natives as to the exact position in which the guligas are found, some saying they may occur in any part of the body, others that they occur only in the stomach and intestines, whilst I have heard others declare that they have taken them from the head and even the hand." (Everett does not state what would seem more probable, that they may be renal calculi.) The monkeys drink the water of certain springs, which must be saline mineral springs, or the creatures are cut off from the use of fresh water. Everett adds that "the widespread idea of the medicinal virtue of these concretions would lead us to suppose that there is some foundation for their reputation."——The *Cervus maral*, of Siberia, has recently been domesticated by Cossacks in the neighborhood of Kiakhta, in Western Siberia, where there are herds of seventy head. The horns of the wild deer, when filled with blood and not ossified, are much prized by the Chinese, who buy them at the Siberian border; but the horns of those which have been domesticated, lose a good many of their original qualities. ——In a recently-discovered stalactite cave at Kinchberg, near Kremsmünster (Austria), a jaw-bone of a man with well preserved teeth was found among numerous remains of *Ursus spelæus*.

ENTOMOLOGY.[1]

THE PERIODICAL CICADA, *alias*, "SEVENTEEN-YEAR LOCUST."—The present year will be marked by a quite extended appearance of this interesting insect, both a seventeen and a thirteen year brood simultaneously appearing. The readers of the NATURALIST are doubtless familiar with the habits and natural history of *Cicada septemdecim* Linn., and those of the thirteen-year race (*C. tredecim* Riley) which agree with it in every respect except in the time required for full development. We will, therefore, simply quote here, with brief comments, what was said in 1868, in the writer's First Report on the Insects of Missouri, regarding the two broods that

[1] This department is edited by PROF. C. V. RILEY, Washington, D. C., to whom communications, books for notice, etc., should be sent.

are to appear the present summer and that will be rendering the woods vocal with their rattling song, in the more southern parts

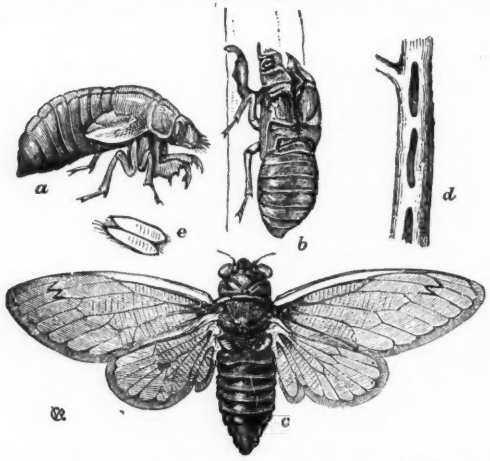

FIG. 1.—*Cicada septemdecim; a*, pupa; *b*, pupa shell; *c*, perfect insect ♂; *d*, twig with egg-punctures, nat. size; *e*, eggs, enlarged. (After Riley.)

of the country, by the time the present number of the NATURALIST is out.

BROOD XVII—*Septemdecim*—1864, 1881.

In 1881, and at intervals of seventeen years thereafter, they will, in all probability, appear in Marquette and Green Lake counties, in Wisconsin, and may also appear in the western part of North Carolina, and about Wheeling, Virginia; in Northeast Ohio, and a few in Lancaster county, Pa., and Westchester county, New York.

There is abundant evidence that they appeared in the counties named in Wisconsin in 1864, and fair evidence that they appeared that year in Summit county, Northeast Ohio, while straggling specimens were found in the same year, by Mr. S. S. Rathvon, in Lancaster county, Pa., and by Mr. James Angus, in Westchester county, N. Y. Dr. Fitch also records their appearance in 1847, or seventeen years previously, in the western part of North Carolina, and Dr. Smith, in Wheeling, Virginia, in 1830, '47, and '64. The distance between the localities given is very great, and it is doubtful whether all these records belong to one and the same brood.

BROOD XVIII—*Tredecim*—1868, 1881.

In the year 1881, and at intervals of thirteen years thereafter, they will, in all probability, appear in Southern Illinois, throughout Missouri, with the exception of the north-western corner, in Louisiana, Arkansas, Indian Territory, Kentucky, Tennessee, Mississippi, Alabama, Georgia and North and South Carolinas.

Though, as already stated, I published the first account ever given of the existence of a thirteen-year brood, yet, besides the others mentioned in this chronology, this particular brood has been traced since, as having occurred in the years 1816, '29, '42, '55, and '68; and Mr. L. W. Lyon, at the July (1868) meeting of the Alton (Ills.) Horticultural Society, even mentioned its appearance in 1803.

In Missouri it occurs more or less throughout the whole State with the exception of the north-west corner that is bounded on the east by Grand river, and on the south by the Missouri river.[1] The south-east part of the State, where Dr. Smith has re-

[1] As Mr. Wm. Raucher, of Oregon, Holt county, saw a few individuals in the north-east part of Buchanan county in 1855, it may occur in small numbers in districts even north of the Missouri river.

corded it since 1829, is most thickly occupied. I enumerate those counties in which there is undoubted evidence of their appearance during the present year (1868), viz: Audrain, Bollinger, Benton, Clarke, Chariton, Callaway, Cooper, Cole, Franklin, Gasconade, Iron, Jefferson, Knox, Lewis, Marion, Macon, Morgan, Moniteau, Pike, Phelps, Pulaski, Polk, Pettis, Schuyler, St. Charles, St. Louis, St. Francois, St. Clair, Warren and Washington.

It not improbably overlaps some of the territory occupied by the *septemdecim* Brood XIV [a brood which appeared last in 1879], but I do not think it extends into Kansas.

In Illinois it occurs more or less throughout the whole southern half of the State, but more especially occupies the counties from the south part of Adams county along the Mississippi to the Ohio, up the Ohio and Wabash rivers to Edgar county, and then across the center of the State, leaving some of the central counties in South Illinois unoccupied. To be more explicit, I enumerate all the counties in which it undoubtedly occurred during the present year (1868): Adams (south part, back of Quincy), Bond, Clinton (north-west corner, adjacent to Madison), Champaign, Coles, Crawford, Cumberland, Clay, Clark, Edwards, Edgar[1] (especially in the eastern part), Franklin, Gallatin, Hardin, Hamilton, Johnson, Jasper, Jersey, Jefferson, Lawrence, McLean (east end), Macon, Madison, Marion, Massac, Monroe, Pike, Perry, Piatt, Pope, Richland, Randolph, Sangamon, Saline, St. Clair, Union (north east corner), Washington, Wayne, Wabash, Williamson and White. There were none the present year, either at Decatur, in Macon county, or at Pana in Christian county; nor were there any at Bloomington or Normal, in McLean; nor in Dewitt county, which lies south of McLean; nor in Spring Creek, Iroquois county, which is north-east of Champaign.

In Kentucky, according to Dr. Smith, it occurred in the north-west corner of the State, about Paducah and adjacent counties south, in 1829, '42 and '55, and it occurred there in 1868.

In Arkansas, it occupied all the northern counties in 1842, '55 and '68.

In Alabama, it occupied Russell and adjacent counties on the east side of Black Warrior river, in 1842, '55 and '68.

In Tennessee, it occupied Davidson, Montgomery, Bedford, Williamson, Rutherford and adjacent counties, in 1842, '55 and '68.

In North Carolina, it appeared in Mecklenburg county, in 1829, '42, '55 and '68.

In South Carolina, the Chester district and all the adjoining country to the Georgia line, west, and to the North Carolina line, north, was occupied with it in 1816, '29, '42, '55 and '68.

In Georgia, it has occurred in Cherokee county since the year 1816.

In Louisiana, it appeared in Morehouse, Caddo, Clairborne, Washington and adjacent parishes, in 1855 and '68.

It also doubtless occurs in Mississippi and Indian Territory, though I am unable to specify any localities.

The last simultaneous appearance of these two broods was in 1860, and their appearance the present year will doubtless enable us to perfect our knowledge of the geographical range of either. Already we have received undoubted indications of their early ascension, as the pupæ have been reported either near or upon the surface of the ground in several of the localities indicated.

It will be observed that the thirteen-year brood (XVIII), is by far the most extended, and that it occurs very generally throughout the Southern States, both east and west of the Mississippi. We have gathered together since the last appearance of this brood in 1868, various facts which extend its range in Georgia and Tennessee, and which show that it also occurs in restricted parts of Indiana.

We shall be very glad to receive detailed information of the

[1] Edgar county also has the *septemdecim* Brood III.

exact limits of either of these two broods, or indeed any record of the appearance of the insects the present year, and these records will be all the more valuable if the years of earlier appearances in the same localities can also be furnished. Information on these points should be sent to the editor of this department.

A NEW SPECIES OF OAK COCCID MISTAKEN FOR A GALL.—An esteemed correspondent from Ohio (Dr. Jno. A. Warder) sends us what he supposed to be some kind of gall which he found at Iron mountain, Mo., on the twigs of *Quercus palustris*. They are pretty large, globular or almost globular, objects fastened to the twigs either singly or in clusters, as we are accustomed to see certain Cynipid galls. Their shining, yellowish surface is handsomely variegated with light-brown patches and with undulating or interrupted black lines. These objects have frequently been mistaken for galls, even by entomologists, but they are in reality the female scales of a Coccid, and are often infested by a Lepidopterous inquiline, *Euclemensia bassettella* (Clem.).

The particular species sent by our correspondent is tolerably common in the South and West on the twigs of different species of the black oak group. It is undescribed, and may be characterized as follows:

Kermes galliformis n. sp. Mature ♀ scale, average length 5 mm. Subspherical, usually somewhat broader than long, and often with a broad shallow constriction medio-dorsally. Attached by a broad, dark-brown cut or excavation, which is covered by a beak anteriorly and notched anally, the brown color extending to a point above the notch. Polished and smooth. Ground color pale yellowish, appearing under lens minutely and evenly speckled with brown; more or less suffused or mottled with gray or brown, the constriction, when present, generally dark. A series of about seven irregular rows of black punctations running across the scale, often connected by an irregular black line, and this again relieved by white or pale yellow. The three uppermost rows most distinct and constant.

The species is quite variable, the general shape and the form of cut point of attachment varying according to the position on a twig or as individuals are crowded; while the general color varies according as one color or the other predominates. Specimens which we have from New Mexico are uniformly without the constriction and with a pale-gray rather than a pale-yellow ground color. Prof. Comstock, Entomologist of the Department of Agriculture, is at work on this family of insects, and will, we hope, soon give us the natural history of many of the interesting forms, of the development of which nothing has so far been recorded.—*C. V. Riley.*

THE "WATER-WEEVIL" OF THE RICE PLANT.—In the February number we called attention to two of the worst insect enemies of the rice plant, first, the "grub," which injures the plant when the water is withdrawn from the soil, and which is the larva of *Chalepus trachyperus* Burm.; second, the "maggot," which has not yet been identified in the imago state, and which we suggested might possibly be the larva of *Spalacopsis suffusa* Newm. We have re-

cently received the following interesting communication from Mr. John Screven, of Savannah, Ga., the specimens accompanying it being *Lissorhoptrus simplex* Say—a tolerably common species throughout the eastern part of the country, and found on various other water plants, so that it is probably not confined to rice as food. We have little doubt but that Mr. Screven is correct in his deduction that this snout-beetle is the parent of the "maggot," in which event the larva differs from the more typical larvæ of the Curculionids, in being quite elongate and not arched. Mr. S. writes as follows:

I send you by express a number of "water-weevils" preserved in alcohol, together with some specimens of the young rice leaves on which they were found feeding. You will observe on the latter the method of the insect in feeding, and will find no difficulty in concluding that when in sufficient numbers, as is sometimes the fact, they may do much damage in the rice fields.

I have observed with great interest and attention your allusion to this insect in the general notes from the AMERICAN NATURALIST, Feb., 1881. But it has suddenly occurred to me as possible that these "water-weevils" are the perfect insect of the "maggot" larva which I sent to you last summer. Allow me to suggest some reasons for this opinion.

1. Both the weevil and the maggot are water insects; both seek the same food, namely, the rice plant, differing however in this, that the one feeds on the leaf and the other on the root of the plant.

2. They differ in their periods of existence, the weevil appearing in April and May, the maggot in the summer months; but this may account merely for the time and circumstances necessary to incubation. Among the specimens sent you, I found several pairs in what appeared to be the act of copulation. These specimens were taken yesterday, April 29th, many of them *in the very spot where were found the maggots which I sent you last summer.* My first note of the latter was July 13th, and allowing one week for the appearance of the weevil after the fields are inundated for the stretch flow, the latter would be found, say, April 17th, making an interval of say ninety days between weevil and maggot, or between the beetle and the larva. This may appear an over-long period, but I assume that water is necessary to the generation and existence of this insect. Now, the "stretch water" does not last more than thirty days. At the expiration of this time the fields are drained and kept dry for at least thirty, very often forty days, and I presume that this fact, forbidding incubating during this period, it would not commence until the harvest flow is put on the fields. In 1880 this flow was applied say June 18th. The maggot was found July 13th, say thirty days after. I am quite ignorant of the periods of insect incubation, but it appears that if water is necessary to the generation and existence of this insect, the "maggot" larva, if from the water weevil, will hatch within thirty days after the harvest water is applied to the fields.

3. The water weevil and the maggot are found in the same habitat, and both disappear on the removal of the water in which they live. I may note here that the weevil is sluggish in its habits, is easily caught, and never "plays possum." It is seen in the greatest numbers in the early morning, feeding on the delicate leaves of the plant, and seeks, crawling down the stem, the cooler recesses under water as the sun grows warmer. Many, however, feed all day.

THE IMPREGNATED EGG OF PHYLLOXERA VASTATRIX.—It is interesting to note how, one by one, all the conclusions we have in former years arrived at, are verified and their accuracy established by European observers having, presumably, no knowledge of what we have recorded. In 1875 (see Transactions St. Louis Academy of Science, Nov. 5, 1875, p. 286) we remarked: "Having already had the young from the impregnated egg of *rileyi* hatch in about a fortnight after it was laid; having shown in pre-

vious writings that this species winters in the larva state, and not in the impregnated egg as does the European *quercus*; and remembering further, that *vastatrix* resembles *rileyi* in wintering as larva, it is safe to conclude that the impregnated egg of *vastatrix* will also hatch the same season that it is laid, and that we cannot apply to it the term 'winter egg,' which Balbiani applies to the impregnated egg of *quercus*. It is not unlikely that since a few of the winged females issue as late even as the latter part of October, some few also of the later produced impregnated eggs may pass the winter unhatched; if so, they may be considered exceptions to the rule. In the same way, a few of the more common eggs from the agamous ♀ may be exceptionally found on the roots in winter, though as a rule only the hibernal larva is found." In the April number of *La Vigne Americaine*, M. P. Graells records some interesting experiments in Spain which establish the fact beyond all peradventure that this impregnated egg is produced there from the months of June to November inclusive, and that the earlier laid eggs hatch and produce the stem-mother a few days after thay are laid. In this we have the true explanation of the larval hibernation of *Phylloxera vastatrix*, corresponding, in fact, with that of *P. rileyi*.

Works on North American Micro-Lepidoptera. — Lord Walsingham's "North American Tortricidæ,"[1] which lays the foundation for a study of the Tortricids of the Pacific coast, and gives a scientific value to Walker's North American species, has already been reviewed by Professor Fernald in *The Entomologist's Monthly Magazine* for September, 1880 (the notice repeated in *Psyche* for October), and by Mr. Grote in *Papilio* for January, 1881. It will be unnecessary to repeat their comments, but as the book is indispensable to any one engaged in studying the parents of our "leaf-rollers," we take pleasure in calling further attention to it. The number of new species collected by Lord Walsingham in California and Oregon, is very large, and there are, besides, several new species described from Texas and a few from other parts of the country.

The illustration and description of Walker's species has been most ably and generously performed. That the coloring of some of the figures is faulty, or not in exact agreement with the descriptions in the text, is doubtless due to the poor condition of the specimens from which Walker described many of his species. It has been suggested that in cases where more than one species has been described by Walker under the same name, the last word has not been said; but it is evident to us that if either of these species had been previously named and described, Walker's name

[1] *Illustration of Typical Specimens of Lepidoptera Heterocera in the collection of the British Museum.* Part IV.—North American Tortricidæ. By Lord Walsingham. London, printed by order of the Trustees. 1879. 4to, pp. 84, with 17 colored lithographic plates.

must sink as a synonym of that earlier name and should not be used for any other species. The application of this principle will doubtless serve to settle the synonymy of his "*Grapholitha discoferana*," among others.

The new genera are *Hendecastema* (which Professor Fernald has, in his review, shown to be synonymous with Clemens's prior genus *Amorbia*), peculiar for the pectinate antennæ of the male, and for vein seven of the primaries being forked in the female but not in the male; *Synnoma*, also with pectinate male antennæ, remarkable for the great size of the abdomen of the female; *Hystrichophora*, differing from Phoxopteris in the longer palpi; and *Proteopteryx*, allied to Grapholitha but peculiar for an abrupt indentation of the posterior margin of the primaries upon vein five, and for the curving of veins three and four towards it. We may add in regard to *Proteopteryx* that *Hedya spoliana* Clem., and *Hedya cressoniana* Clem., have identically the same structure, and will doubtless take their place in that genus; but that this character is not confined to a single genus is evident from its occurrence in a new genus which we have, in a paper just published,[1] named *Proteoteras*, and which differs from *Proteopteryx* in the rough scaling of the primaries and the presence of a peculiar costal tuft on the male secondaries.

One of the more remarkable species described, *Carpocapsa latiferreana*, we have found, by breeding the male, to present characters for a distinct genus, allied to Zeller's Ecdytolopha, which we have named *Melissopus* (*l. c.* p. 322), the origin of vein two of secondaries being nearer the base of the wing than in Carpocapsa, and the male having a very deep pocket behind this vein and having the posterior tibiæ and tarsi greatly dilated.

A list of forty-eight species of Tortricids common to Europe and North America is given. This is a valuable contribution to the subject of the geographical distribution of the Lepidoptera, the strongest relationship being traced between Europe and the Pacific coast of North America. As Lord Walsingham deals more particularly with these western species, it may be that a similar treatment of our eastern Tortricid fauna will produce nearly corresponding results, although here the introduced species may play an important part. The species in this list which are of interest to the economic entomologist, are, *Retinia duplana* Hüb., *Retinia sylvestrana* Curt., and *Retinia pinivorana* Zell., all from Oregon; *Eudemis botrana* Schiff., which has been known in America as *Penthina vitivorana* Pack., *Phoxopteris comptana* Frŏl., supposed to be the same as *Anchylopera fragariæ* W. and R., though Prof. Fernald finds that we have the European *comptana* here and believes that *fragariæ* is a good species; *Tmetocera ocellana* (Fabr.), and the well-known *Carpocapsa pomonella* (Linn.). As introduced species there should be added to the list *Dapsilia rutilana* Hübn.,

[1] Descriptions of some new Tortricidæ, Trans. Ac. Sc. St. Louis, IV, p. 321.

treated of in our Report to the Department of Agriculture for 1878, and probably *Eulia ministrana* which we have received from the late Dr. LeBaron of Illinois, and also *Spilonota roborana* Schiff. (*cydnosana* Fabr.) which we have reason to believe is the same as *Hedya Scudderiana* Clem. = *Euryptichia saligneana* Clem. = *Pædisca affusana* Zell.

In regard to the conventional specific ending to the names of Tortricids, we notice that Lord Walsingham follows Zeller in making it conform to the gender of the generic name; thus we have *Lophoderus gloveranus* and *Exartema sericoranum.*

Lord Walsingham's paper on Tineidæ[1] and his "Pterophoridæ of California and Oregon,"[2] have been reviewed by Mr. V. T. Chambers and Mr. Charles Fish in the November number of our contemporary, the *Canadian Entomologist.* In the latter monograph appears the first general treatment of any portion of the North American species and the success of Lord Walsingham's collecting in California and Oregon is shown in the discovery of twenty-seven new species of this restricted group of moths, making the whole number known from Northwest America, thirty-eight. Some interesting introductory remarks are given in regard to the geographical distribution and variation of the species; and a new genus, *Trichoptilus,* is proposed for "probably the smallest known species of Pterophoridæ," differing from all other genera in the front wings being cleft to the middle and in the tuft of scales on the third lobe of the hind wings being situated only just beyond the middle.—*C. V. R.*

Moths Mistaken for Aletia.—Mr. F. A. Walthall, of Newburn, Ala., sends us a number of moths, which he captured during the latter half of February flying in immense numbers at evening time around buildings, and which he supposes to be the cotton-moth. They are, however, all *Platyhypena scabra* (Fabr.), which has been so often recorded by us as being mistaken for Aletia. This Platyhypena is by far the most common winter moth in the South, and while it is a difficult task to find during the cold spells of a southern winter any other Noctuids which we know to hibernate as imago and which are seen flying about on warm evenings, this species can always be found, even during the coldest spell. A very slight shelter, such as the loose bark of dead trees, fence posts, etc., is sufficient to protect it from the cold, and it has been found alive in such places where other hibernating insects, *e.g.*, Carabidæ and Heteroptera were frozen stiff and dead.

Several other correspondents have lately sent moths from the South under the supposition that they were Aletia. Those from Mr. J. W. Burch, of Fayette, Miss., and from Mr. H. Hawkins, of

[1] *On some new and little known species of Tineidæ.* By Thomas, Lord Walsingham. 8vo, pp. 17, 2 plates. From Proc. Zoöl. Soc., London, 1880.

[2] *Pterophoridæ of California and Oregon.* By Thomas, Lord Walsingham. 8vo, pp. 66, 3 plates. London, John Van Voorst, 1880.

Hawkinsville, Ala., are *Phoberia atomaris*, while those from Mr. J. S. Newman, Atlanta, Ala., are the Platyhypena above-mentioned.

Scale Insect on Raspberry.—Mr. R. B. Fulton, of Oxford, Miss., sends us a raspberry cane covered with a scale insect, with the following remarks: "The insect has been ruinous to the black-cap raspberry in this vicinity for the last three or four years. Old raspberry plants have been dug up and thrown away to get rid of the pest. It first appeared (or was noticed) in one garden, and has spread to all in this vicinity. If it is a bark-louse, and if, as is stated by Harris, the female has no wings, how could the insect have spread so rapidly to six or eight gardens? I have not noticed it on the red or yellow raspberry. It multiplies so fast that it seems useless to try to kill it by any applications to the plant."

The whitish, flat, either broady-oval or round scales on the cane are, judging from the scales and eggs, those of the widespread Harris's bark-louse (*Diaspis harrisii* Walsh), which is known to infest various trees and shrubs. The mode of spreading of this and other scale insects, the females of which never acquire wings, is more rapid than is generally supposed. The young lice which hatch in the spring are very active during a few days, and can overrun a large garden in a very short time. They may easily be carried from one garden to another by the wind or by the aid of birds or flying insects. In most cases, however, the female scales are transported from one place to another on cuttings and nursery stock. The best way to counteract the ravages of this insect is to dig up and burn, in winter time, *all* infested plants. New plants should always be carefully examined and thoroughly cleansed before planting.

Specific Value of Apatura alicia Edw.—Mr. W. H. Edwards gives, in the October number of *Psyche*, recently issued, a full account of the adolescent stages of this species and concludes that its specific value is confirmed thereby. Bearing in mind the variation which we know to occur in the larva of *Apatura celtis*, we are constrained to attach less importance to the slight differences which Mr. Edwards points out between it and the larva of *alicia* than he himself gives to them. The facts brought out, however, strengthen the claim of *alicia* to stand as a name characterizing a special form. Whether it be considered a good species or not is hardly worth discussing on account of the great latitude of opinion as to what constitutes a species.

ANTHROPOLOGY.[1]

Anthropology in Germany.—Just as the Journal of the Anthropological Institute represents our science in England, and the Bulletins, Revue and Materiaux, exhibit the labors of anthropologists in France, so in Germany the cream of all contributions

[1] Edited by Prof. Otis T. Mason, Columbian College, Washington, D. C.

finds its way into the Archiv für Anthropologie. The first and second quarterly parts of the thirteenth volume close the year 1880. The volume consists of original papers, shorter communications, reviews, and reports of meetings.

The original contributions are as follows:

1. The occurrence of a tail on human beings, pp. 42, 1 table, by Dr. Max Bartels, of Berlin.
2. Monuments and localities with which the myth of Nerthus is associated. A communication to the Anthropological Society of Kiel, March 16, 1880. [This paper is founded upon a passage in the Germania of Tacitus, chapter 40.] pp. 10, by Heinrich Handelmann.
3. Circumcision, by Richard Andree.
4. Contribution to a Craniology of the European races. 1. With a table of curves, by Professor J. Kollman.

Quite extended reviews appear of Mook's "Prehistoric Egypt," Hart's "Stone implements in the Museum of Rio Janeiro," Molon's "Ligurians," Habel's "Sculptures of Santa Lucia," Rau's "Palenque Tablet," and "Archæological collections in the National Museum," Bell's "Jungle Life," Marty's "Color Sense," Emmert's "Eye and Skull," and Valentini's "Calendar Stone."

A supplement of 160 pages contains a stenographic report of the eleventh general meeting of the German Society of Anthropology, Ethnology and Prehistory in Berlin, August, 1880. Nos. 9, 10 and 11 of *Correspondenz-Blatt* give an account of the organization, a list of the members, a résumé of the proceedings, and a catalogue of works presented at the meeting.

ANTHROPOLOGY IN FRANCE.—The *Revue d'Anthropologie* for January of the current year, furnishes the following contributions to our knowledge:

Quelques subdivisions des groupes basés sur l'indice cephaliques, by Paul Broca.

De l'embryogenie dans ses rapports avec l'anthropologie (Leçon d'ouverture a l'Ecole d'Anthropologie), by Mathias Duval.

Classification et chronologie des haches en Bronze, by M. Gabriel de Mortillet.

Les Negres chez eux (Part 2), by M. Mondiere.

Sur quelques crânes de criminels et de suicides, by MM. Ten Kate and Pavlovsky.

Revue Critique—"Les Samoyedes," of Zograf and Bogdanof.

Rev. Préhistoriques—Soc. d'Anthrop. de Paris; The antiquity of Man in Dauphiny, etc.; Anthropological Society of Berlin, and Congress of Prehistoric Archæology at Lisbon.

Revue des Livres—Crania ethnica; and Discovery of America by the Normans in the 10th century.

Revue des Journaux—French, Italian, American, English, German.

Miscellanea—Société d'Anthropologie; Laboratory of Anthropology of the School of Higher Studies; Conferences on Anthropology by the Faculty of Sciences at Lyons; On anthropological instruction in Italy; Congress in Algiers in April, 1881.

Bibliography—Six closely printed pages are devoted to bibliography.

THE EGYPTIAN STONE AGE.—The New York *Nation* for January 13, alludes to the researches of Dr. Mook as finally setting at rest the greatly disputed question as to the existence of a Prehamitic population in the valley of the Nile. In the number for

January 27, Mr. Henry W. Haynes, of Boston, calls the attention of the editor to the fact that as early as 1868 he himself had discovered palæolithic axes of the St. Acheul type, together with a most extensive series of all the usual implements that are found in other countries in which the existence of the "stone age" is regarded as established. Mr. Haynes also states that it was he who first directed Dr. Mook's attention to the palæolithic implements, and complains that Dr. Mook has almost totally ignored him in his work. The death of Dr. Mook, recently announced, will deprive our countryman of the explanation which is justly his due.

PREHISTORIC ILLINOIS.—At the second annual meeting of the State Natural History Society of Illinois, held in the State House at Springfield, Feb. 8--10, the following papers were read: "The ancient agricultural implements of stone found in the Illinois river bottoms and in the mounds in the Mississippi valley," by the Hon. Wm. Mc. Adams, of Otterville; "The Palenque Tablet," by Professor Cyrus Thomas; and "The Ancient Illinois," by the Hon. J. G. Henderson, of Winchester. Only the most meager report of these interesting papers has reached us, hence the brevity of this notice.

ANCIENT WORKS IN NEW YORK.—There are within ten miles of Watertown, N. Y., many ancient fortified village sites, not to speak of those obliterated by the plow. We cannot use the term mound, as applicable to this locality, for there are no artificially constructed mounds found here. One of the most marked features is, that all these sites were fortified, or defended with ditches. They are nearly all located upon the sandy moraines of extinct Adirondac glaciers, or sand strewn hills. A few fishing stations along the shores of Lake Ontario and Black River bay are the exceptions, and even these are upon sandy slopes. There seems to be no uniformity in the shape or construction of the lines of defence; one at Black River bay had the ditches in the form of circles, one within the other, and a lunette towards the water, with a protected roadway to the shore. One in Rutland, on the farm of Mr. Gragg, has the trench cut across the base of a peninsula, between two forks of Sandy creek, a steep hill serving as embankment for the rest of the enclosure, and usually the lines run along the edges of an escarpment. I am informed by several of our elderly inhabitants, that these lines of entrenchments near our cemetery, were a mile and a half long, and some of the trenches five feet deep. Pottery of the usual forms, and nearly always broken into small pieces, is a constant accompaniment of these fortified sites, and it is generally blackened on the inside with charred food, showing that the owners cooked with heated stones thrown into the vessels. The jar or pot, the most perfect specimens I have met with, was dug up in the town of Rutland many years since,

and is owned by Mr. J. A. Lawyer of this city. Arrow-heads, stone-axes, scrapers, knives, bone awls, charred corn, etc., found west and south, are dug up from the graves of these people, or strew the sites of their homes.—*David S. Marvin.*

THE AMERICAN ANTIQUARIAN.—The number for January of this useful Journal makes the following contributions to anthropology:—The military architecture of the emblematic Mound-builders, by the Rev. S. D. Peet; Oregon and her Prehistoric relics; Lookout mounds in Ohio; Earthworks on the Missouri river; The ancient pottery makers; Wisconsin copper finds and lake dwellings; The rapid formation of rock strata in Oregon; Wild rice; Nest of flint relics; The Mound-builders in Minnesota; Indian relics in a mound; Ancient man in Missouri; Relics of the Mound-builders near Joliet Ill.; Gold ornaments in Tehuantepec; Aleutian mummies.

GERMAN ANTHROPOLOGY.—Our readers will remember that there was an exhibition of the prehistoric and anthropological collections of Germany in Berlin, from 5–21 August, 1880, under the protection of the Crown Prince, and in connection with the eleventh annual meeting of the German Anthropological Society. Under the direction of Dr. A. Voss, of Berlin, an illustrated catalogue and supplement have been published, 619 and 48 pages. In these volumes are brought together not only descriptions of the objects exhibited but catalogues of books and lists of localities which makes them really a complete hand-book of German anthropology.

ANTHROPOLOGY IN GREAT BRITAIN.—The Journal of the Anthropological Institute is coming more and more to reflect the labors of British anthropologists. In the number for November, 1880, No. II, Vol. X, the original matter is supplemented by ten pages of miscellanea. The original papers are as follows:

Notes on Fijian Burial Customs. By the Rev. Lorimer Fison.

Flint Implements from the Valley of the Bann. By W. J. Knowles, Esq.

On the cranial characters of the natives of the Fiji islands. By W. H. Flower, LL.D., F.R.S.

The Ethnology of Germany. Part V. The Jutes and Fomorians. By H. H. Howorth.

Observations upon the methods and processes of Anthropometry. By Dr. Paul Topinard.

The Japanese People: their origin and the race as it now exists. By C. Pfoundes.

The paper of greatest value to the readers of the NATURALIST is that of Dr. Topinard. Anthropometry is the measurement of the entire human body, to determine its proportions: 1, at different ages, to learn the law of the relative growth of parts; 2, in races, so as to distinguish them; 3, in all environments, in order to ascertain their influence on variation. As the few skeletons in our museums are insufficient to obtain a just average, all our efforts should tend to perfect the methods of operating on the

living, and to simplify them so as to render them available by travelers, officers of the army and navy, recruiting agents, teachers, etc. To obtain good measures one should demand only a few, such as height, breadths, some circumferences, and perhaps the facial angle.

The center of the patella, adopted in the statistics of the Civil war is preferred upon the living to all others, as one datum point. From the summit of the olecranon to the upper border of the head of the radius is another. And, indeed, Dr. Topinard boldly affirms that when it is impossible to reconcile anatomical exactness with external configuration, the former must give way. Those engaged in anthropometric investigations cannot afford to omit reading this paper.

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GEOLOGY AND PALÆONTOLOGY.

THE TACONIC SYSTEM IN GEOLOGY.[1]—The existence of a series of stratified rocks in the Appalachian valley, intermediate in age between the older crystalline or primitive schists and the Palæozic rocks of the New York system, was taught by Eaton and main-

[1] Abstract of a paper read before the National Academy of Sciences at Washington, April 18, 1880.

tained by Emmons, whose Taconic system, as first proposed, was later declared by him to consist of an upper division, which he referred to the horizon of the calciferous sandrock of the New York system, and a lower division, the proper Taconic. In this latter was included a great group of quartzites, limestones, and soft crystalline schists, which have since, by different geologists, been assigned to not less than three distinct horizons in the New York system. The grounds of those contradictory opinions have been supposed stratigraphical relations, and also the apparent association with the Taconic limestones of organic remains belonging to these various horizons.

In localities away from the disturbed regions of the Appalachian valley there exists a series of rocks occupying the position assigned by Emmons to his Lower Taconic, and agreeing with this in its essential characters. Such a series is found north-west of the Appalachian region, a little to the north of Lake Ontario, where it rests upon schists like those of the Green mountains, and is unconformably overlaid by the Trenton limestone, and totally distinct from the lower members of the New York system in the adjoining region. Another locality is to the south-east of the Atlantic belt, in southern New Brunswick, where a similar series of several thousand feet of limestones, quartzites and schists occupies a position inferior to the fossiliferous Cambrian (Menevian). In both of these localities the rocks in question correspond closely in volume and in mineralogical characters to the Lower Taconic rocks of the Appalachian valley, with which the speaker believed them to be identical.

Again, Mr. W. O. Crosby has lately described a similar series in the Island of Trinidad, resting on the ancient crystalline rocks and overlaid unconformably by limestones of Trenton age.

We have thus abundant evidence of a great and wide-spread series of rocks, pre-Cambrian in age, and occupying the position assigned by Emmons to the Lower Taconic or Taconian system —which, according to him, extends continously along the Appalachian valley from Vermont to Alabama, and moreover occupies large areas to the south-east of the Blue Ridge, from Virginia to Georgia, constituting, in South Carolina, the Itacolumite series of Lieber.

Within the vast region occupied by these rocks in the great valley, have been found a few small areas of fossiliferous strata, belonging chiefly to the Ordovian (Siluro-Cambrian) or to the Cambrian series; but the characters of the great mass of these rocks are such as to lead to the conclusion that they constitute, as maintained by Emmons, a more ancient series.

To the Taconian rocks belong the peculiar magnetic iron-ores found at Reading, Cornwall, and Dillsburg, Penn., which have been by some geologists regarded as Mesozoic, but were by Rogers assigned to the base of the Palæozoic. To this same

series belong the limonites of the great valley, which occur in clays derived from the sub-aërial decay of the rocks. These rocks, in their unchanged condition, contain beds and masses of siderite and pyrites, the alteration of which *in situ* has given rise to the limonites. In the formation of this from siderite or iron-carbonate, it was pointed out by the speaker that there is a contraction of volume equal to about 20 per cent; to which is due the cellular character of the limonites and their frequent occurrence in the form of geodes.

These older rocks are not without traces of organic life, having yielded in the Appalachian valley the original *Scolithus*, and related markings, besides obscure *Brachiopods;* and in Ontario, besides similar Scolithus like-markings, a form apparently identical with the *Eozoön* of the more ancient gneisses. We may hope to find in the Taconian series a fauna which shall help to fill the wide interval that now divides that of the Eozoic rocks from the Cambrian. We should seek in the study of stratigraphical geology not the breaks dividing groups from each other, so much as the beds of passage which serve to unite all these groups in one great system, remembering that there is no local hiatus which is not somewhere filled up by the continuous process of nature.—*T. Sterry Hunt.*

A FOSSIL PHYLLOPOD CRUSTACEAN FROM THE QUATERNARY CLAYS OF CANADA.—We have received through the kindness of Principal J. W. Dawson, LL.D., of Montreal, a valve in partial preservation, of an Estheria quite unlike any existing American form. The following account of its discovery is from Principal Dawson:

"It was found at Green's creek on the Ottawa river, in nodules in the Post-pliocene clay, holding skeletons of *Mallotus villosus* and other northern fishes, and shells of *Leda (Portlandia) arctica*, *Saxicava rugosa*, &c.; also leaves of Populus, Potamogeton, &c. The deposit is of the age of the Leda clay of the St. Lawrence (middle glacial) and belongs to a period of submergence where in the bay or estuary then representing the Ottawa river, northern marine animals were imbedded in deposits into which was also washed the débris of neighboring land, and of fresh water streams. The climate at the time was colder than at present, and the area of land less, so that if this Estheria still lives, it is most likely to be found in the vicinity of the Arctic coast."

This Estheria is entirely unlike any northern American or European species, differing decidedly from *Estheria morsei* or *E. caldwelli* and *E. clarkii*. It rather approaches *E. jonesii* from Cuba in the form of the shell and style of marking of the valves. It does not resemble closely any of the fossil forms figured in Jones' Monograph of fossil Estheriæ. The markings, however, present some resemblances to *E. middendorfii* Jones, but differs in the want of anastomosing cross wrinkles between the ridges.

One valve and portions of others were preserved; but none of

them show the beaks (umbones), though the form of the remainder of the shell indicates that they were situated nearer the middle of the valve than usual, *i e.*, between the middle and the anterior third of the shell. The shell is deep, probably more so than in *E. jonesii*, though the valves have evidently been flattened and somewhat distorted by pressure, but apparently the head-end was more truncated than in *E. jonesii*, as the edge of the shell and the parallel lines (or ridges) of growth along the head-end are below bent at right angles to the lower edge of the shell. The raised lines of growth are very numerous and near together; they are of nearly the same distance apart above near the beaks as on the lower edge. The very numerous lines of growth are thrown up into high sharp ridges, the edges of which are often rough, finely granulated, and often the valleys between are rugose on the surface. In one or two places a row of papillæ for the insertion of spinules may be seen where the shell has been well preserved, and between many of the lines of growth there are irregular superficial ridges. Length 10 mm.; depth 7.5 mm.

The valve is evidently that of an Estheria, much truncated anteriorly, and with the lines of growth much thicker, higher and closer together than in any North American species known to us, and may prove when better specimens are found, to be allied to the tertiary Siberian *E. middendorfii.*

The species is named in honor of the discoverer, J. W. Dawson, LL.D., who has so persistently and ably investigated the Leda clays of Canada.—*A. S. Packard, Jr.*

Miocene Dogs.—In the Bulletin of the Hayden Survey, Vol. VI, p. 177 (Feb., 1881), I gave a synopsis of the genera and species of this family found in the Lower Miocene formation of the Western Territories. These numbered seven and nineteen respectively. The recovery and discovery of some material since that date, enables me to make the following corrections and additions: (1) The proper dental formula of *Hyænocyon* is I. $\frac{2}{3}$; C. $\frac{1}{1}$; Pm. $\frac{3}{3}$; M. $\frac{1}{1}$. Its reference to the Canidæ is not certain. (2) It seems that the species I named *Icticyon crassivultus* cannot be placed in *Icticyon* on account of an important difference in the dental formula. It must be considered typical of a new genus which I will call *Oligobunis*, and compare its characters with those of *Icticyon* as follows: *Oligobunis*, I. $\frac{3}{3}$; C. $\frac{1}{1}$; Pm. $\frac{4}{4}$; M. $\frac{1}{2}$; an internal tubercle of the inferior sectorial, which has a basin-shaped heel; *Icticyon*, I. $\frac{3}{3}$; C. $\frac{1}{1}$; Pm. $\frac{4}{4}$; M. $\frac{2}{2}$; no internal tubercle of the inferior sectorial, which has a trenchant heel—*E. D. Cope.*

Reinsch's Microscopic Investigations of the Structure of Coal.[1]—Whilst there is a general agreement among geologists that the coal of all geological formations is of vegetable origin,

[1] *Neue Untersuchungen ueber die Microstructur der Steinkohle des Carbon, der Dyas und Trias.* Von Paulus Friedrich Reinsch. Mit 94 lithographirten Tafeln. Leipzig, T. O. Wiegel, 1881.

there have been contentions from time to time, in the literature, as to the mode of accumulation of such immense masses of vegetable material, and as to the species of plants furnishing it. In his book on Chemical Geology, 1861, Dr. Fred Mohr argues forcibly in favor of the hypothesis that the massing together of marine algæ, or seaweeds, in bays by oceanic currents will account for many otherwise inexplicable occurrences of coal beds. This view, however, was unable to gain a foothold against the botanical evidence furnished by the fossil plants so beautifully preserved in the slates overlying the coal beds, and which are terrestrial plants exclusively, belonging to much higher organized families than the algæ. The frequent occurrence, too, of whole fossil forests of Sigillarids and Lepidodendroids, rooting in the underclay and penetrating the coal beds at right angles, are as many evidences for the swamp hypothesis. Thus far no internal evidence had been furnished, that is to say the structure of the coal itself had not been made a part of the argument on either side. This is owing to peculiar mechanical difficulties connected with the preparation of microscopic sections of coal. Thus, whilst many industrious observers have examined sections and noticed the presence of organic structure, no one has ventured to interpret what he saw, botanically, because nothing can be seen distinctly unless the cutting of the section be proceeded with in a certain way. At this point Professor Reinsch steps up with the beautiful work now before us. He tells of his microscopic work upon the metamorphic limestones of the Huronion, *i. e.*, the Eozoön Canadense, the quartz schists and the hornstone concretions of the Silurian limestones of Ohio; and how he then turned his attention upon the coal, and with the previously gained experience, soon obtained such remarkable results, that the apparent hopelessness of getting satisfaction from the serpentinized and silicified structures, was turned into exultation by the carbonized material. Here there could be no more doubts, whether the things seen under the microscope were sedimentary, concretionary or crystalline or organized structures. The results and conclusions of Professor Reinsch's work may be summed up as follows:

1. *Preparation of the Sections.*—A plane cut as in rock and mineral sections, generally is not serviceable; the cut must be made in relief. Thus only the different forms can be brought out, as according to their hardness each form will become more or less transparent, since the softest parts will be worn faster and hence be finally thinner and more transparent than the more resisting forms. Sections parallel to the bedding are made without difficulty. Not so sections at right angle. Much precaution is to be exerted with these. Cut the raw plate with a steel saw 4 mm. thick, 15 mm. square. Make a plane cut as usually in rock sections, but using only the finest emery (polishing emery) or precipitated carbonate of calcium. Then rub the surface gently

in all directions with a cork plate (perfectly soft and no grains) 10 mm. square and moistened with a drop of glycerine. This treatment produces the relief. Frequent examinations must be made under the microscope, to observe the point where the desired transparency has been reached (not less than 0.01 mm.). In some cases as for Trichites and Grammites it is best to warm the raw plate and saturate it with a mixture of wax and paraffine. When attaching the plate to the support, it should neither be heated very long with the balsam nor too short a time; the first excess causing the plate to warp, crack, and inducing a partial alteration of some of the coal constituents; too little boiling causes the plate to detach itself from the support during the process of grinding. Chemical treatment with acids or alkalies is not advisable.

A microscopic image of the condition of things in a coal section may be had by closely inspecting a sharp cut through a compressed ball of hay. Here the innumerable plant individuals are cut in every direction. The different sections of the same plant have often so little in common, that an identification of the species is extremely difficult. This is true of a microscopic coal section, and only the comparison of very many specimens will establish the common characters of the forms. Prof. Reinsch's conclusions are drawn from 1200 perfect sections.

2. The organic forms of the coal consist of Protophytæ. That is, plants without distinct cell structure, with sporadic enclosures of spores and tissue fragments of cryptogamous and still higher plants. The analogous forms of the present time being Bacterium, Vibrio, Asterothrix, Protoleptis, Zoöglœa, etc.

3. These forms constitute seven generic types (thus far) in a lower and higher order.

A. Naked Plasma, forming indefinitely outlined bodies, without indication of an exterior wall.

I. *Racostromidæ.* Plasmatic thalloms, stronger trunks branching into many connected branchlets. Substance uniform, without celluloid structure. (Color in section, brown red to deep purplish red, semi-transparent.)

II. *Trichodidæ.* Trichomic plasma, running into numerous capillary ramifications. Separation of the plasma into two substances indicated.

III. *Grammitoidæ.* Plasmic thalloms composed of a honeycomb web. No cells. Uniform opaque substance.

IV. *Asterophragmidæ.* Plasmatic thalloms resembling Racostromium, but whose substance is connected with radially arranged spheres, composed of centrogranular, polarizing granules.

V. *Blastophragmidæ.* Trichoid plasma forming Trichomata, from whose granular substance polarizing spheres are formed, as in Asterophragmium.

B. The plasma forms definitely outlined bodies with an indication of external wall.

VI. *Plasmidæ.* The thalloid plasma is not yet clearly outlined by an external wall, but is composed of a granular, or fibrillary substance from which primary cells are developed.

VII. *Chroococcidæ.* The plasmatic body has become a cell, surrounded by an external wall not fully developed.

Of these types, fifty-two specific forms are described in the

book, and richly illustrated with admirable drawings, without whose assistance a description is not intelligible.

4. From the great rapidity with which, under proper surroundings, the Bacteria and even the fresh-water Desmids grow and multiply, the considerable thickness of strata which the siliceous cells of the latter accumulate in a few years, there is no longer difficulty in the way of understanding the formation of coal beds now, nor the absence of microscopic structure in all true coals, nor their compactness. For pressure alone is amply sufficient to produce this density. Nor is the difference in chemical composition of various coals now so much astonishing, since this will depend on the composition of the predominating protophytes of the stratum. However, these points are not investigated yet, as indeed the whole study has not advanced beyond the establishment of a few fundamental theses. Professor Reinsch does not expect a rapid acceptation of his views, but he desires stimulating capable observers everywhere, to carry the light of science into this dark field of hereditary beliefs.

In conclusion, we would heartily congratulate Prof. Reinsch for this invigorating contribution to geology, in the prosecution of which upon our vast carboniferous areas, botanists and chemical geologists should join hands.—*George A. König.*

Geological News.—Dr. Alpheus Hyatt has published his researches on the forms of *Planorbis* found in the Tertiary beds of Steinheim. The variations are extraordinary, and furnish important evidence for the evolutionist.——Neumayr and Uhlig publish an extensive and well illustrated paper on the Ammonites of the "Hilsbildungen" of North Germany, in the last number of the *Palæontographica.*——Professor H. A. Nicholson, of Edinburgh, publishes a handsomely illustrated volume on the possibly polypoid group of the *Monticuliporidæ.*——Mr. S. A. Miller has recently described some additional species of the interesting genus *Myelodactylus* Hall.——Professor Cope has published in the Proceedings of the American Philosophical Society, the cuts illustrating the Permian vertebrata described in his Paleontological Bulletin, No. 32. The genera illustrated are *Eryops*, *Cricotus*, *Empedias* (= *Empedocles* nom. praeocc.) and *Dimetrodon.*

GEOGRAPHY AND TRAVELS.[1]

Important Discoveries in South America.—In the Naturalist for April, 1879, mention was made of the departure of Dr. Edwin R. Heath, of Wisconsin, from New York, in November, 1878, for a journey of exploration along the Beni and Madre de Dios rivers, in Brazil. He proposed to continue the work of the late Professor Orton, so sadly interrupted by his death. The *Kansas City Review of Science* for April, contains an interesting account of the success of Dr. Heath's expedition. He has ex-

[1] Edited by Ellis H. Yarnall, Philadelphia.

plored the Beni and made very valuable additions to our knowledge of this heretofore almost unknown region.

Dr. Heath writes from Reyes, Bolivia, December 20, 1880: "The question of the Beni is solved. The work of Professor Orton is finished. I made the trip from Cabinas (rubber camps on the Madidi) in a canoe with two Indians. I left Cabinas September 27th, and after delays from sickness of my men, at 8 A.M., October 8th, discovered a new river entering from the south, and at mid-day of the 8th, arrived at the junction of the Madre de Dios with the Beni. No other white man has ever seen the mouth of this magnificent river. Crude measurement gave 735 feet for the width of the Beni, and 2350 for that of the Madre de Dios. Took careful observations for latitude and longitude. At 6.50 A. M. of the 9th, I passed the mouth of a river the size of the Yacuma, entering from the north, to which I gave the name Orton. At night we slept on a sand bar joined to a large island. On the 10th we passed this island, and at 8 A. M. another large one, and at 10 A. M. came to a line of rocks obstructing the river and making rapids. One mile further down we came to the main fall, which exhibits a perpendicular descent of the entire river of thirty feet. We occupied the remainder of the 10th in drawing our little craft over the rocks to the water below. With much risk we passed the waves below the falls and camped. On the morning of October 11, we passed some rocks in the river corresponding to the rapids of the Palo Grande of the River Mamoré, but which here offer no serious obstructions to navigation. At 10 A. M., October 11, 1880, we arrived at the mouth of the Beni —that is, at the junction of the Beni and Mamoré Rivers. From thence we ascended the Mamoré, three hundred miles, to Exaltacion and Santa Ana to this place, two hundred miles west over the pampas; brought my boat on an ox cart.

"Here I am safe and sound with a map of three rivers—Beni, Mamoré and Yacuma. From the River Madidi to the mouth of the Beni, there are but four families of Pacavara Indians in the place of 'multitudes of man-eating savages,' as every man, woman and child in Bolivia has believed during many score of years. Rubber gatherers are already taking advantage of my exploration, and have established camps further down the Beni."

On account of superstitious fear of the unexplored portion of the River Beni, the productions of the rubber camps on the River Madidi have ascended the River Beni two hundred miles to Reyes, thence east two hundred miles to River Mamoré, thence three hundred miles north to its union with the Beni—seven hundred miles around, in place of less than three hundred miles direct. The waters of the Beni come down from the gold mines of Bolivia, and through forests of cinchona trees, and those of the Madre de Dios from a much larger area of similar territory of Peru.

"Dr. Heath," writes Professor Parker in the *Kansas City Review*, "alone, unaided, spent two years in patient, determined preparation near the scene of the proposed exploration, and then, in a frail canoe, with only two Indian servants, with certain death before them, as all Bolivia believed, paddled bravely forth to explore a great river and extensive country, where during 350 years, a score of costly expeditions have disastrously failed. It is thought that the governments of Peru and Bolivia will give official recognition of his daring and successful achievement. His work will develop and change the commerce of many hundred miles of mountain and plain. Rubber and bark will now descend the Beni instead of going six or seven hundred miles around."

FRANZ-JOSEF LAND REVISITED. II.—We extract from a paper prepared and read before the Royal Geographical Society, by Mr. C. R. Markham, the following additional information concerning the geology of the land visited by Mr. Leigh Smith.[1]

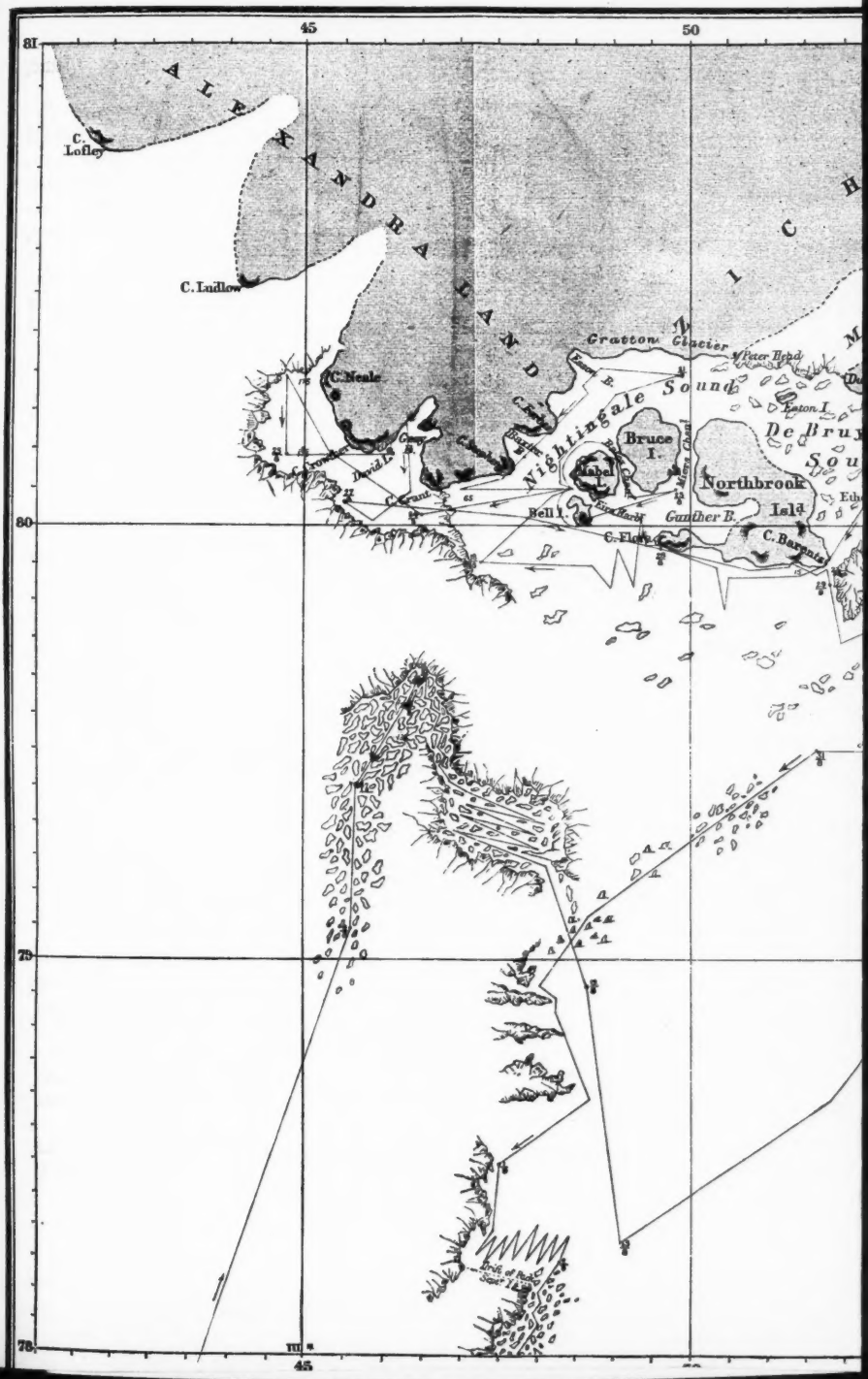
"The lowest rocks belong to the Oxford clay, and are represented, in the collection brought home in the *Eira*, by two belemnites. Above the Oxford clay the rock is of the cretaceous period, to which the fossil coniferous wood belongs, including one very perfect cone. There are also slabs with impressions of plants. Over all there has been an overflow of basalt and lava forming a cap, as on the Island of Disco. The collection of fossils brought home by Captain Markham from Novaya Zemlya, proved the existence of carboniferous rocks there, which dip under the more recent formations of Franz-Josef Land. Exactly the same carboniferous fossils were found by Sir George Nares Expedition at Cape Joseph Henry; and these discoveries point to the probable existence of a carboniferous series of rocks in the unknown region nearer the Pole, on which the cretaceous rocks of Franz-Josef Land are resting. The complete geological examination of the unknown region is one out of many important results to be derived from further Polar discovery."

Mr. Markham also speaks of the collection of invertebrate animals found in the sea on the coast of this newly discovered land. Among the Crustacea is "a new genus of Pycnogonida, or sea spiders, a really very interesting form which has never been described before," and which Mr. Miers, writing in the *Annals and Magazine of Natural History*, has named *Anomorhynchus smithii*, after its discoverer. "These sea spiders are found in the British seas of very small size. The large ones have been collected in the Kara Sea; but this new genus is peculiar to the sea of Franz-Josef Land."

In our narrative[2] of Mr. Smith's voyage, we took from the London *Times* a notice of a "can" being seen on Wilczek Island,

[1] Proceedings of the Royal Geographical Society, March, 1881.

[2] NATURALIST, March, 1881, p. 254.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ALEXANDRA LAND
C. Lofley
C. Ludlow
C. Neale
Gratton Glacier
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Nightingale Sound
Bruce I.
Abel I.
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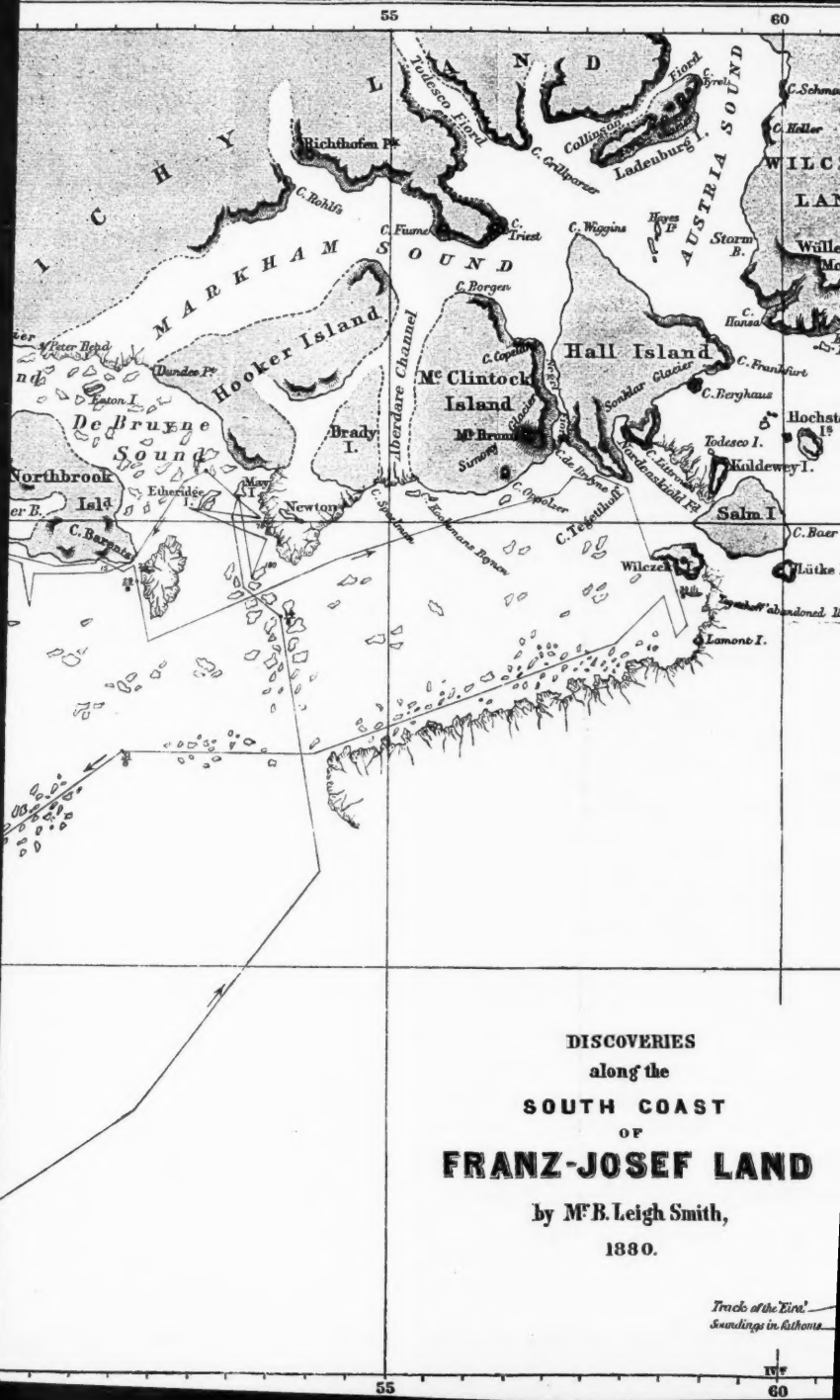
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L A N D
I C H Y
Richthofen Pk
Todesco Fiord
C. Grillparzer
Ladenburg I.
Collingwood Fiord
AUSTRIA SOUND
C. Rohlfs
C. Fraser
C. Triest
C. Wiggins
Hayes I.
Storm B.
MARKHAM SOUND
C. Borgen
Hooker Island
Aberdare Channel
Mc Clintock Island
Hall Island
C. Frankfurt
C. Berghaus
Sondder Glacier
Hochst
Todesco I.
Kuldewey I.
Salm I.
C. Baer
Lütke
Wilczek
Lamont I.
Peter Head
Dundee Pt
Eaton I.
De Bruyne Sound
Brady I.
Northbrook Isld
Cape Barrow
Etheridge I.
Newton
C. Oppolzer
C. Tegetthoff
Lieutenant Payer's abandoned
DISCOVERIES
along the
SOUTH COAST
OF
FRANZ-JOSEF LAND
by Mr B. Leigh Smith,
1880.
Track of the 'Eira'
Soundings in fathoms
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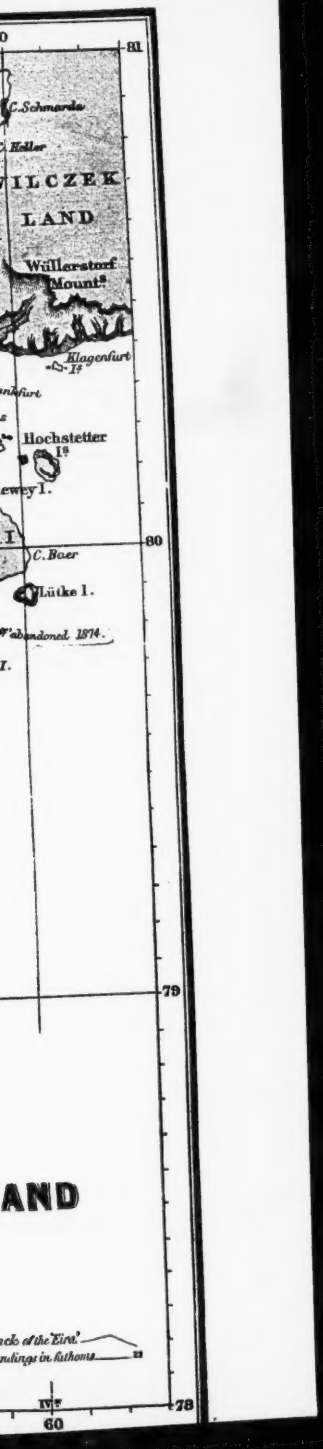
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but it should have been, it now appears, a *cairn* erected by the Austrian expedition.

In the interesting discussion which followed the reading of this paper, Captain Sir George Nares said, in the course of his remarks: "From Payer's voyage it was learned that the Arctic migratory sea-birds went to Franz-Josef Land earlier than to any known spot. The precise reason for this has not yet been ascertained, but it afforded evidence that the water in the channels that Payer traveled over always thawed earlier in the summer than in other parts of the Arctic seas very much further south. This must be in consequence of some very strong current pouring through the strait represented in the chart, thawing the ice. He could not think that this current flowed from the south; if it did it would carry the ice towards the land, and there could not possibly be such a large quantity of water there. He therefore reasoned that the current came from the north, causing a large body of water close to the land by forcing the ice south; a vessel bound north would meet this ice at a distance from the land, and would have to force her way through it." "Mr. Markham has referred to the heavy icebergs that were born there. What became of them was not known. If his conclusion about the northern current was correct, this, in combination with a movement towards the north-west of a lower stratum of warmer water, would carry them towards Wiche's Land, of which nothing was known. They were not found drifting down past Hope Island and Bear Island in any great quantities, and it was still uncertain where they went."

Mr. Etheridge, F.R.S. (President of the Geological Society) said: "Amongst the few specimens which Mr. Leigh Smith had brought, were two or three of what appeared to be distinctly coniferous wood. To settle the age of that wood was a very important question. Was it Eocene, Cretaceous, Tertiary or any other age? After very careful examination of the cone which had been brought home, Mr. Carruthers had no doubt whatever that it belonged to the true genus Pinus. There were but two pines now known in the Siberian area, the *Pinus sembra* and *Pinus pallasiana*. No other fossil plant-remains had been brought from that region, but he had no doubt that it was Upper Cretaceous. That settled the question of the existence of Cretaceous rocks and fossils there. Beneath the Cretaceous zone there was, undoubtedly, Oxford clay, which was one of the most important formations in Great Britain and Russia. Beneath that again were older rocks still. A great deal had been done with regard to the groups of Palæozoic rocks in the northern regions, especially through Sir George Nares and Captain Fielding, who secured a fine collection of fossil Mollusca and corals. Captain Markham's investigation of Novaya Zemlya had proved the existence, in that island, of carboniferous rocks, agreeing closely with

those of the Pennine chain. Probably from Petchora Land to Spitzbergen was once continuous land. Sir Roderick Murchison had proved the existence of carboniferous rocks in Petchora Land and the Ural chain, but until he himself examined the specimens from Novaya Zemlya, they were not known to exist in that island. Since Sir George Nares returned, the complete flora of those parts had been described; but unfortunately nothing had been done on the northern coast of Greenland to the eastward, and an exploration of that district and of Franz-Josef Land would give clearer information as to the geological history of the Polar regions, which he felt certain were largely composed of carboniferous rocks. By placing the several acquisitions together and comparing notes on the Ural chain, Petchora Land, Novaya Zemlya, Franz-Josef Land, and Spitzbergen, a complete history could be obtained of those rocks which stretched away to the north of Asia and America."

"The great bulk of the collection brought home by Sir George Nares was carboniferous, but the coal found was of Miocene age and thirty feet thick. No one could doubt this if he knew the plants contained in the shales, &c." * * * * "In the whole region examined by Sir George Nares, none of the carboniferous corals discovered could have lived in water less than 77°, 78° or 80° of temperature, so that most of the rocks of which the Polar regions were composed must have been formed in tropical seas. It was well known that large Enaliosaurian reptiles (Ichthyosauri) had been found in Spitzbergen. There were other things brought back by Mr. Leigh Smith, which he (Mr. Etheridge) could not yet make out, but they appeared to him to be older still. With regard to the great lava flows, they appeared to be nine in succession, most likely occurring about the same time as that of the Giant's Causeway, in Ireland, in the Miocene period, or at about the same age as the thick bed of coal found in Smith Sound. These lava flows are perfectly horizontal for many miles, showing that their condition now was just as formerly."

The Third International Geographical Congress. — We have received the programme of the next meeting of the Congress, to be held at Venice on September 15th of this year, and to continue to the 22d. There are three classes of members: subscribers paying fifteen francs, donors giving not less than forty francs, and honorary members, nominated by the committee of arrangements. The sections of the Congress are: I. Mathematical geography, geodesy and topography. II. Hydrography. III. Physical, geological, meteorological, botanical and zoölogical geography. IV. Anthropological, ethnological and philological geography. V. Historical geography. VI. Economical, commercial and statistical geography. VII. The study, teaching and diffusion of geography. VIII. Explorations and travels.

Any language can be used by the speakers. Representatives

are invited from all geographical societies. Delegates will represent different departments of the Italian Government, and it is desired that commissioners should be appointed by the Governments of other countries. Geographical societies are invited to send in suggestions of questions to be discussed.

In connection with the Congress there will be held an International Geographical Exhibition to be open during the month of September. It is divided into sections corresponding to those of the Congress as follows:

Class I.—Instruments of practical geometry. Apparatus and instruments of topography, geodesy and astronomy. Telemeters, and instruments for measuring velocity. Tables of projection and calculation. Maps exhibiting the various systems of projections. Sidereal maps; maps of triangulation and hypsometry. Original topographical charts. Publications relating to the measurement of the earth. Photographical apparatus.

Class II.—Instruments, portable and of precision, relating to hydrography. Reflectors. Chronometers, marine and pocket. Logs, leads, dredges; apparatus for deep sea sounding; thermometers for measuring the temperature at different depths; instruments for measuring tides and currents; compasses and other nautical instruments (instruments for reduction, parallel and other rulers, &c.).

Marine charts, general, coasting and special; plans of harbors and anchorages. Views of coasts. Maps of currents, winds and tides. Tables and Ephemerides for the use of astronomers and mariners. Publications relating to hydrography and maritime geography. Guides to navigation; catalogues of lighthouses, beacons, &c. Proposals for a uniform international system of buoys and beacons, and for completing the lighting of the coasts. Laying of submarine lines of telegraph.

Class III.—Instruments for observing meteorological phenomena. Maps, atlases, globes representing facts relating to the dominion of physical geography and meteorology. Magnetical charts (isoclinous, isogonous and isodynamic). Charts of isobars and isotherms, &c. Maps of geological, zoölogical and botanical geography. Other publications and collections relative to this branch.

Class IV.—Maps and atlases referring to general anthropology, ethnology and comparative philology. Other publications and collections relating to these subjects. Grammars and vocabularies of languages little known; comparative studies.

Class V.—Maps and other publications of historical geography. Ancient and modern works and manuscripts relating to the history of geography. Ancient maps and globes. Instruments used by ancient geographers, astrolabes, &c.

Class VI.—Works, charts and diagrams of statistical, economic and commercial geography (population, agriculture, manufactures, commerce, public works, colonization, &c.). Collections of commercial products and objects made from a geographical point of view.

Class. VII.—Treatises and methods for instruction in geography. Outlines and landscapes. Wall maps; models and instruments for instructions in geography. Atlases and geographical dictionaries. Charts and maps of the globe, terrestrial and celestial globes. Copies of topographical charts; maps and plans in relief. Different methods of reproducing maps (photography, heliotyphy, lithography, zincography, photolithography, chromolithography, &c.). Materials and apparatus specially used in the preparation of maps.

Class VIII.—Instruments for expeditions, astronomical determinations and topographical copies; traveling barometers and thermometers, pedometers, sextants, &c. Portable photographic apparatus, specimens of camera lucida. Route maps; sketch maps. Essays, fac-similies, reproductions and collections of every description which illustrate voyages of discovery, photographic views and drawings of countries little explored Instructions for geographical expeditions. Instruments and equipment of a traveler; portable arms, utensils, tents and medicines; portable boats; waterproof coverings and clothing; apparatus for giving light on nocturnal marches and encampments. Modes of packing and carrying on voyages of discovery. Narratives and publications of all kinds relating to geographical voyages. Publications and instruments used in Alpine climbing.

MICROSCOPY.

TEST OBJECTS. AMPLIFIER.—Why I think little of the Podura as a test, is, that it requires a skilled microscopist to appreciate it for that purpose, and a skilled microscopist can judge of the value of a lens by its performance on any object. Test-objects are of most use to a beginner, and if he does not know exactly what he ought to see, a skilled showman can make them both a delusion and a snare.

I might perhaps add to the working distance question that a concave lens inserted in the body of the microscope as an amplifier, will give increased working distance to any objective, and if we have to deal with a cover just too thick to focus through without it, the insertion of the concave will enable us to focus through at once—within limits, of course. If a flint lens, it does not much interfere with definition, and is sometimes of use to overcome the difficulty.—*Edwin Holmes in English Mechanic and World of Science.*

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SCIENTIFIC NEWS.

— Dr. James Lewis, the well-known conchologist, died of apoplexy, at his home at Mohawk, N. Y., February 23, 1881. He was born at Schuyler's lake, Otsego Co., New York, in July, 1822. He was, therefore, nearly 59 years of age at the time of his death. Like many another who has become distinguished in natural science, his earlier education was confined chiefly to the common school. At the age of twenty-four he began to read medicine, and prosecuted his studies for some three years, when he became interested in dentistry, and abandoning the broad field of general medicine, devoted himself to this special branch of medical science. For this he was eminently fitted by his great mechanical skill, and to the implements employed in his art he contributed many permanently valuable improvements. It is as a naturalist that we have to consider Dr. Lewis. He became interested in nature in his childhood, and that interest deepened with years into admiration, and admiration into love, which led him to intelligent, untiring pursuit. It was while he resided in Boston, Massachusetts, from 1849 to 1851 that he became interested in his favorite science and formed the nucleus of what was to become one of the most valuable private collections of American land and fresh-water shells extant. From that time until a year or two previous to his death, he was a most devoted student and untiring enthusiastic collector. He is widely known to the authorities in the science he cultivated by a very extensive correspondence, of which art Dr. Lewis was certainly a master. Within the scope of his acquaintance are embraced all the living names familiar to the younger naturalists, and many others who have passed away. His published works, when the magnitude of his labors

and the opportunities they have presented are considered, have not been many, but all published possess permanent value. They date from 1854, and number some eleven titles. The first consists of notes on "*Alas.* (*Marg*) *marginata*," published in 1854. In 1856 he published three papers, two in the Proc. Bos. Soc. Nat. Hist. and one in the Proc. Acad. Nat. Sci., all relating to the Mollusca of the State of New York, and two of them are local lists, with notes. In 1857 he published a single paper "On Erosion of Uniones," in Proc. Bos. Soc. Nat. Hist. In 1860, two papers, one on "Colors of Unionidæ," and the other a local list, both of which appeared in the Proc. Acad. Nat. Sciences of Philadelphia. He published nothing further until 1868, when appeared a paper in the *Am. Jour. of Conchology*, "On the Mollusks of the Mohawk valley." In 1869, in the same journal, he published a valuable paper "On the Shells of the Coosa river," Alabama. The bibliography and indices of Dr. Lea's "Synopsis of the Unionidæ" next engaged his attention, and they are, in great part, largely arranged by him. His last published work of value appears in the Geological Report of Alabama for 1875(?), and contains the almost complete geographical distribution, by streams, of the shells of that State. Some very suggestive remarks are likewise appended as notes to the work which he has there performed. He was also an occasional contributor to the NATURALIST. The major part of his life's work remains behind him in the form of MSS., many of which had they been published, would add largely to our knowledge of fresh-water forms. The most of these have passed into the hands of my collaborateur, Mr. A. F. Gray. The great work of Dr. Lewis was as a systematist. In this field he was an acknowledged master, and here his services were frequently required by individuals and freely given. He arranged and classified many public collections, among which were the American fresh-water shells in the Smithsonian Institution, the last critical revision of which was made by him; the collection of the Buffalo Acad. of Nat. Sci., those of Vassar College, Mount Holyoke Seminary, Wellesley and Hamilton Colleges, and the State Cabinet at Albany. The examination of these extensive collections furnished him with material for the determination of synonomy, which, had he lived to complete it, would have very greatly reduced the number of acknowledged species. In work of this character he was truly philosophic, and his opinions commanded and obtained respect. The great changes in scientific thought occasioned by the doctrines of evolution, found an ardent advocate in him, and those great principles formed the basis of all his later work. He has often remarked, and repeated it to others in his correspondence, that the great work of the future would be done from this standpoint, and "much remains to be done in eradicating the errors of the older naturalists." He was a conscientious worker, an acute thinker, and a man of great research. In the prosecution of his studies he was

indefatigable, and here was the cause of his disease—a nervous disorder which reached its climax in his death. He lived but five hours after the apoplectic stroke, and died without regaining consciousness. His merits were recognized by various scientific societies in electing him to a membership, among which were the Philadelphia Academy, the Boston Society Nat. Hist., the American Association for the Advancement of Science and the Buffalo Academy. To the publications of all these he was a contributor. In his death science loses a man of no ostentation, but of patient and painstaking endeavor; in manner he was reserved at times, but always gentlemanly and courteous; he was single in his purpose, and devoted in pursuit of his objects. It is with a deep sense of personal loss that these lines are penned in memory of one who was universally kind and helpful; a kindness and helpfulness that many another has shared time and again at the hands of Dr. Lewis; advice was always freely given, nor was aid ever denied when aid was needed. His death is a loss to American science that all will deplore.—*R. E. C.*

— The working naturalists of Des Moines have recently organized as a working body, adopting as the style of the organization, "The Agassiz Field Club," the leading idea of which is therein set forth. Articles of incorporation were filed in the latter part of April. The club is composed of specialists in various branches of natural science, and limits the membership to twenty-five, some extended acquaintance with some branch or another being a necessary antecedent to an election. Three directors were chosen, Messrs J. A. Jackson, Professor L. B. Cary and Wallace Bailey. At the formal organization, Rev. Dr. C. A. Pomeroy was chosen president, and Professor R. Ellsworth Call, corresponding and recording secretary. The club will publish any results reached which may prove of sufficient value, in the form of occasional Bulletins. It proposes, ultimately, to work up the natural history of the entire State—a thing long and sadly needed. Aside from occasional local contributions, made by individuals and at little expense save to themselves, nothing has been done in this State, and the field is open still to investigation. Dr. Parry has alone done much in its botany, Mr. J. A. Allen in its ornithology and mammalogy, and there the natural history work ends. Twice has the General Assembly instituted a geological survey, and as often brought them to an abrupt ending. The survey of Professor James Hall, from 1855–1860, resulted in the gathering of a vast amount of material which has never been in full worked up and described.[1] The General Assembly, after receiving and distributing the volumes published in 1858, containing a partial account of the material obtained, and with the evidence of progress before them in a printed supplement, with maps, sections,

[1] Dr. Hall has since described and illustrated a large number of these forms in the Annual Reports N. Y. State Cabinet of Natural History. But there are now many of them, rare and costly, and beyond the reach of the student.—*R. E. C.*

&c., of portions of the coal field, prepared for publication, not only refused to publish or go on with the field work, but refused to refund to the principal geologist the salaries of his assistants, and expenses of the survey for the preceding year, which he had advanced from his own means, or to pay for his own services during that time; all of which to this day remains unpaid. This was not only dishonest but foolish—dishonest, because repudiating a just debt; foolish, because a continuance of the survey meant a clearer insight into the riches of the great State for whose highest interests they were sent to legislate. Then came the survey of Dr. White, the results of which, in an imperfect form, were ordered printed despite the protests of the geologist, and the survey again brought to a close. The complete geology of the State is still unknown. Many thousands of dollars are being expended in the counties of Page, Fremont, Mills and Montgomery, in a vain attempt to find coal. The survey of Dr. White, incomplete as it necessarily was, had demonstrated that no coal could be obtained in that portion of the State, at a distance from the surface to prove remunerative. Personal observations confirm the accuracy of his judgment. So the field is still open, and the various societies in the State might apportion it into districts, convenient to the seat of each, and accomplish a work which a short-sighted legislature declared useless. There are local geologists of some reputation in Iowa, and they could thoroughly and completely perform the work.—*R. E. C.*

— An important memoir on the crustaceans of the Caribbean sea and the Gulf of Mexico, has been read by M. Alph. Milne-Edwards to the Paris Academy. The material he has to deal with had been sent him by Mr. Agassiz, and obtained during cruises in the *Blake*, in recent years. The author is struck with the great difference between the fauna of the coast and that of the deep parts. The shore animals are of a highly-organized type, while the deep-water animals have a more ancient character. A large number of new species have been met with, and it has often been necessary to form new generic divisions. Several groups, formerly thought foreign to American seas, have been found abundant at great depths (*e. g.* the family of Galathea). The infinite variety of forms is very remarkable, and the accepted modes of classification will often not apply. There is a large number of transition-forms. M. Milne-Edwards considers that the study of animals, living at great depths, is only begun, and he invites men of science to organized effort in a domain which is certain to prove highly fruitful.

— M. Certes has lately found a method of coloring infusoria and anatomical elements during life. Placed in a weak solution of chinoline blue or cyanine, infusoria are colored pale-blue, and many continue to live 25 and even 36 hours. Strong doses poison immediately. Again, after being 24 hours in a moist chamber,

the white blood corpuscles of a frog colored with cyanine show amœboid movements. The cyanine should here be dissolved in serum. Chinoline blue is, *par excellence*, the reagent of fatty matter. By affecting the cellular and not the nuclear protoplasm in infusoria, it shows fatty matters to exist only in the former. It should prove a useful means of studying cellular life.

— The annual meeting of the Society for the Promotion of Agricultural Science will be at Cincinnati, on Tuesday, August 16, 1881, the day preceding the sessions of the American Association for the Advancement of Science.

The following gentlemen have indicated to the secretary their readiness to present essays at the coming meeting: Professor S. W. Johnson, Patrick Barry, Professor W. J. Beal—subject, Testing seeds, Professor J. Henry Comstock, Professor E. W. Hilgard, Professor R. C. Kedzie—subject, The ripening of wheat, Professor A. J. Cook, J. J. Thomas, L. B. Arnold, E. Lewis Sturtevant, M.D.

— The sixth session of the Summer School of Biology will open at the Peabody Academy of Science, Salem, Mass., July 12th, continuing for four weeks. It is designed expressly for teachers. Professor E. S. Morse, the director, will be aided by Dr. J. W. Fewkes, Dr. C. S. Minot and Professor Straight, and Messrs. Fish and Sears.

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PROCEEDINGS OF SCIENTIFIC SOCIETIES.

National Academy of Sciences.—The annual meeting began in Washington, April 19, the president of the Academy, Professor W. B. Rogers, of Boston, in the chair. The list of papers read is as follows:

Tuesday, April 19.—"The domain of physiology," by T. Sterry Hunt; "The compass plant of the western prairie," by B. Alvord; "The solar constant," by S. P. Langley; "The color of the sun," by S. P. Langley; "On mountain observations" by S. P. Langley; "On the relations of soils to health," by R. Pumpelly; "Reduction to sea level of barometric observations made at elevated stations," by Elias Loomis.

Wednesday, April 20.—"On electric light photometry," by Geo. F. Barker; "On the condenser method of measuring high tension currents," by Geo. F. Barker; "On the relation between strains and impacts and the structures of the feet of mammalia," by E. D. Cope; "On the progress of pendulum work," by C. S. Peirce.

Thursday, April 21.—"On the carbon lamp fiber in the thermo-balance," by Geo. F. Barker; "Upon the production of sound by radiant energy," by A. Graham Bell; "On the later Tertiary of the Gulf of Mexico," by E. W. Hilgard; "Recent researches in the vicinity of Behring's strait, comprising, 1. An account of the land ice of Kotzebue sound and the Arctic coast; 2. Additions to our knowledge of the currents and temperature of the ocean in the vicinity of Behring's strait," by W. H. Dall; "A method

for finding the proximities of the orbits of minor planets," by C. H. F. Peters: "Structure of the wings of insects, studied palæontologically," by Samuel H. Scudder; "Biographical memoir of S. S. Haldeman," by J. P. Lesley; "On the auriferous gravels of California," T. Sterry Hunt; "On the utilization of the sun's rays in heating and ventilating," by Edw. S. Morse; "Results just obtained with regard to the molecular height of hydro-fluoric acid," by J. W. Mallet.

At the executive session of Thursday, Professor A. W. Wright, of Yale College, and Professor H. A. Rowland, of Johns Hopkins University, were elected members, and the following were elected members of the council; Professor S. F. Baird, Professor Wolcott Gibbs, Cambridge; Professor A. Hall, United States Navy; Professor J. E. Hilgard, Coast Survey; Mr. Clarence King, Mr. Fairman Rogers, Philadelphia; Professor Simon Newcomb was elected home secretary, and Professor J. H. C. Coffin, United States Navy, treasurer.

Boston Society of Natural History (Section of Entomology), March 23.—Mr. Edward Burgess, of the Bussey Institution, described the structure of the pharynx in the Orthoptera, and particularly in Anabrus, where its muscular development is as well marked as in the case of the Lepidoptera. A closely similar arrangement of longitudinal and annular, or transverse, muscular layers, as well as suspensory muscles, obtain in both orders; and thus the evolution of a powerful sucking pharynx from one possessing only the ordinary function of deglutition is made easy.

Mr. Burgess spoke also of the very uniform character of the endocranium in mandibulate insects. This portion of the interior skeleton has received almost no notice, but will be found an interesting study, and its modifications throughout the hexapods deserve to be followed up.

April 6.—Professor Penhallow described the manners and customs of the Ainos of Japan, and Mr. F. Gardiner, Jr., gave an account of the work done by the U. S. Fish Commission during last summer.

April 20.—Dr. J. S. Diller read additional notes upon the felsites and associated rocks north of Boston, and Mr. J. S. Kingsley described the anatomy of a five-legged frog.

New York Academy of Sciences, New York, March 28.—The following papers were read: Notes on the fauna and flora of the gorilla region, Equatorial West Africa, by Mr. Hugo von Koppenfels; On the occurrence of *Helix aspersa* (European) in California, and the geographical distribution of certain West American land-shells, etc., by Mr. Robert E. C. Stearns.

April 4.—Mr. N. L. Britton read a paper on the geology of Richmond county (Staten Island), N. Y.

April 11.—The following paper was read: On the building and ornamental stones used in New York, with illustrations of their microscopic structure, as shown in the lantern by polarized light, by Mr. Alexis A. Julien.